REVISION AND PHYLOGENETIC ANALYSIS OF THE *HADRONEMA* GROUP (MIRIDAE: ORTHOTYLINAE: ORTHOTYLINI), WITH DESCRIPTIONS OF NEW GENERA AND NEW SPECIES, AND COMMENTS ON THE NEOTROPICAL GENUS *TUPIMIRIS*

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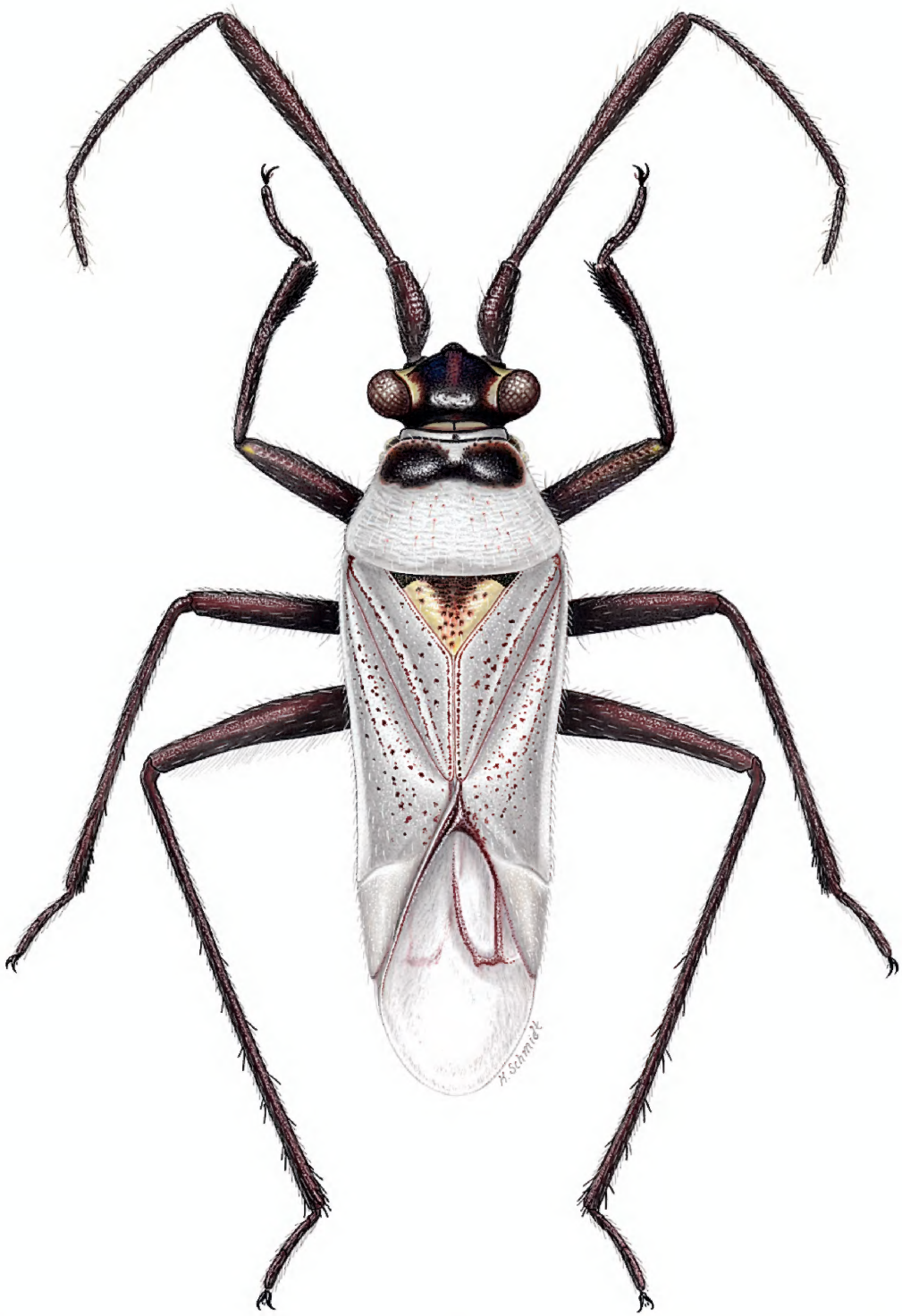

Daleapidea daleae Knight, 1968, type species of *Daleapidea*, a member of the *Hadronema* group that is associated with species of *Psorothamnus* (Fabaceae).

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ABSTRACT

Aoplonema Knight, *Daleapidea* Knight, *Hadronema* Uhler, and *Hadronemidea* Reuter are revised. *Aoplonema nigrum*, sp. nov., *A. rubrum*, sp. nov., *Hadronema incognitum*, sp. nov., and *H. mexicanum*, sp. nov. are described. *Hadronemidea echinata*, comb. nov. is proposed for *Hadronema echinata* Gruetzmacher and Schaffner, 1977. *Aoplonemella*, gen. nov. is described to accommodate *Hadronema festiva* Van Duzee, 1910; and *Origonema*, gen. nov. is described to accommodate *Hadronema splendida* Gibson, 1918. *Scutomiris setosus*, gen. et sp. nov. are described from Baja California Sur, Mexico. This new genus is superficially similar to the Neotropical genus *Tupimiris*. Male genitalic characters not mentioned in the original description of *T. scutellatus* are illustrated and compared with those of *S. setosus*, showing that the two are not related. *Aoplonema*, *Aoplonemella*, *Daleapidea*, *Hadronema*, *Hadronemidea*, *Origonema*, and *Scutomiris* form a monophyletic group herein denominated the *Hadronema* group. Dorsal habitus color photographs of all the species, scanning electron micrographs of selected species for each genus, and illustrations of male and female genitalic characters are provided for all species. Keys to separate the genera and species treated in this paper are presented. A phylogenetic hypothesis of relationships among the genera is proposed, and host-plant associations are discussed.

INTRODUCTION

The genus *Hadronema* was described by Uhler (1872) to accommodate his new species *H. militaris*. Subsequently, additional species of *Hadronema* were added to the genus without further discussion or modification of the generic concept: *H. decorata* Uhler, 1894, *H. pictum* Uhler, 1894, *H. robusta* Uhler, 1894, *H. princeps* Uhler, 1895, *H. festiva* Van Duzee, 1910, *H. albescens* Van Duzee, 1918, and *H. infans* Van Duzee, 1918. Gibson (1918) described *H. splendida* and *H. confraterna*, with the latter being subsequently placed in *Lopidea* (Carvalho, 1958). Gibson (1918) was also the first to provide a key to the known species. Van Duzee (1928) described *H. uhleri* for specimens misidentified as *H. robusta* and transferred the latter taxon to *Lopidea*. *H. infans* was synonymized with *L. minima* Knight, 1918 (Carvalho, 1958; Asquith, 1991). "*Hadronema*" thus became an omnibus name under which various species were described by the authors without fixing a concept or giving a diagnosis.

Knight (1928) was the first to revise *Hadronema*. He recognized the sexually dimorphic spines on the front femora for males of certain species, grouping those species under the nominal subgenus. He described *Aoplonema* as a subgenus for the remaining species lacking spines. *Hadronema splendida* was included by Knight (1928) in *Hadronema* (*Hadronema*) without examining specimens, although males of this species are known not to have the particular armature of the fore femora. Knight (1928) also described several other new species in the nominal subgenus (*H. bispinosa*, *H. breviata*, *H. simplex*, and *H. sinuata*) and in the subgenus *Aoplonema* (*H. uniformis*).

Gruetzmacher and Schaffner (1977) described *Hadronema* (*Aoplonema*) *echinata* from Texas, expanding the concept of *Hadronema* to accommodate this "anomalous" species, which they considered did not deserve its own generic grouping. *Aoplonema* was subsequently elevated to full generic status, including *H. echinata*, based on male genitalia and "other characters" (Kerzhner and Schuh, 1995).

Knight (1968) described *Daleapidea* to accommodate his new species *D. daleae*, as well as *H. albescens*. This genus was later revised by Schuh (1989), who additionally transferred *H. decorata* to *Daleapidea*. Schuh (1989) considered that *Daleapidea* is not related to any other Nearctic genus, suggesting that related groups likely occurred in the Neotropics. Nonetheless, some characters of the male genitalia are similar to those found in *Hadronema*, *Aoplonema*, *Hadronemidea*, and the new taxa treated in this paper.

The monotypic genus *Hadronemidea* Reuter, 1908 was described based on females from Mexico (Reuter, 1908). Reuter (1908) considered *Hadronemidea* to be related to *Hadronema*. The description is accurate, but unfortunately no illustrations were provided. With the exception of catalogs, *Hadronemi-*

dea has not been mentioned again in the literature until the present paper.

Tupimiris scutellatus was described from Brazil without discussion of its relationship to other Neotropical genera (Carvalho and Schaffner, 1973). *Scutomiris setosus*, a new genus and species from Mexico described in this paper, and a member of the *Hadronema* group, resembles *Tupimiris* based on the swollen scutellum and vestiture composed of two kinds of setae. Male genitalic characters, however, show that they are not related. Affinities of *Tupimiris* with other Orthotylini genera are uncertain.

The biology of species of *Aoplonema*, *Daleapidea*, and *Hadronema* is mostly unknown, and for *Hadronemidea* nothing is known. Their species are reported to feed chiefly on legumes and apparently less so on Asteraceae (Knight, 1968; Kelton, 1980; Schuh, 1989). Additionally, some species apparently are attracted to cantharidin baits, as well as probe through the intersegmental membrane of meloid beetles (Pinto, 1978; Young, 1984a, 1984b). Some of these species are aposematically colored with bright red and black patterns. It is not known if color pattern is associated with any toxic property. Behavioral observations in the field are scarce for most species of the *Hadronema* group. Besides the observations by Pinto (1978) and Young (1984a, 1984b), Schuh (1989) provided additional insight into the behavior of one species, *D. daleae*, which has a contrasting color pattern and males with striking wasplike movements.

The *Hadronema* group is restricted to North America, with most of the species occurring in the western United States, and a few ranging north into Canada and as far south as central Mexico.

The aim of this paper is to revise *Aoplonema*, *Daleapidea*, *Hadronema*, and *Hadronemidea*, including descriptions of new taxa, and to provide documentation of their distributions, host plants, and a suite of unique and diverse morphological structures. A phylogenetic hypothesis of relationships among these taxa is presented.

MATERIALS AND METHODS

Observations were made using a Nikon SMZ1500 stereoscope. Scanning electron micrographs (SEM) images were taken with a Hitachi S-4700 Field Emission SEM or a Phillips XL 30 ESEM. Dorsal habitus color digital images were made using a Microptics photomicrographic system, with Infinity K2 lens and CF-2 or CF-3 objectives.

Measurements (table 1) were made using an industrial micrometer mounted on a Wild M7 stereoscope, with Mitutoyo displays (assembled by Stangert Corporation, Island Park, NY). Total length was measured from the apex of the clypeus to the margin of the membrane. Because the hemelytral membrane is often deflexed or partially damaged, the measurement from the apex of the cuneus to the apex of the clypeus is also given. The lengths of the remaining structures were measured as follows: head, from the apex of the clypeus to the area before the anterior margin of the pronotum; antennal segments (II and III), from base to apex; pronotum, from its anterior margin to its posterior margin; scutellum, from its anterior margin to its apex; cuneus, from the costal fracture—at the level of the hemelytral margin—to its apex. The interocular distance was measured between the medial margins of the left and right eye. The widths of the structures were measured as follows: head, between the lateral margins of the left and right eye; pronotum, between its lateral margins; scutellum, between the lateral margins at its base.

Male genitalic dissections were prepared by first removing the abdomen or the last tergites of it, then clearing the structures in warm 10% NaOH. They were then neutralized in distilled water, dehydrated in 95% ethanol, and examined in a hollow plate filled with glycerin. The genital capsule was removed and the connecting apodemes severed to extract the phallus. In some instances, the aedeagus was dissected to remove the phallotheca and to clearly see the vesica. Female genitalia were dissected by severing the whole abdomen and macerating it in the same solution as for males. Subsequent dissections separated tergites from sternites, removed sternites II–VII from the ovipositor, and separated with a probe the first and second gonapophyses. The dorsal wall was then severed from the posterior wall with the aid of a small probe. Observations and drawings of male and female genitalia, embedded in a

hollow slide with glycerin or glycerin jelly, were accomplished with the aid of an Olympus BH-2 or a Nikon Eclipse 80*i* compound microscope under 20× or 40× with a camera lucida attachment.

Terminology presented by Kelton (1959) and Konstantinov (2003) was followed for male genitalia, except the term phallotheca that Konstantinov (2003) regard as "theca". The term "genital capsule" is equivalent to "pygophore" of other authors (see Konstantinov, 2003: 6, and references therein). Davis (1955) and Scudder (1959) were followed for female genitalic terminology. The paired dorsal lobelike processes of the interramal sclerites of the posterior wall (Davis, 1955) are in this paper designated as the "dorsal lobes of the interramal sclerites" (= "K" structure, Slater, 1950). Morphological terms for male genitalic structures used throughout the paper are presented in figures 6, 7, 21, and 26; for female genitalic structures, see figures 8 and 9.

In the description of the female abdomen, sternum VIII is interpreted as the first gonocoxa fused with tergite VIII, as argued by Scudder (1959). In the descriptive sections, the transverse carina of the posterior margin of the vertex is abbreviated as "transverse carina". The term "collar" on the thorax refers to the narrow and flattened dorsal area anterior to the anterior margin of the pronotum, which structurally is the dorsal extension of the proepisternum. Orthotylinae usually do not have such a collar (Schuh, 1974), but it is present in other mirid groups, such as the Mirini and Stenodemini (Mirinae) (Schwartz, 1987). Nevertheless, some Orthotylinae may exhibit a flat narrow collar, such as *Orthotylus bilineatus* (Fallén, 1807) (Southwood, 1953), *Naniella* spp., *Falconia* spp. (Schuh, 1974), and in species of the *Hadronema* group.

For species of *Aoplonema* a principal component analysis (PCA) and a canonical variate analysis (CVA), using 11 standard Miridae measurements (see table 1), were performed in order to examine and further assess the limits of the species.

Specimens from several entomological collections listed in the "Acknowledgments" were borrowed for this project. During the course of the project 5709 specimens belonging to the *Hadronema* group were examined. All the specimens examined are associated with a unique specimen identifier (USI) number, which has the format AMNH_PBI followed by identification numbers (e.g., AMNH_PBI 00190720). These USI numbers unambiguously identify a particular specimen from the Plant Bug Planetary Biodiversity Inventory Project (PBI). Its associated information can be searched through the project's locality database (http://research.amnh.org/pbi/databases/locality_database.html) or through the "Discover Life" website (http://www.discoverlife.org/).

Illustrations depict morphological structures of the taxa treated in this paper. In some cases more than one specimen was illustrated to document intraspecific variability. In all cases, each structure or sets of structures are associated with USI numbers, linking the illustrations to particular specimens. The USI numbers for the specimens of the dorsal habitus photographs and of the SEM are listed in two appendices.

Host plants are those on which adult insect specimens can feed and on which immature forms develop (e.g., Visser, 1986; Asquith, 1991; Mayhew, 1997; Verdon et al., 2007). In practice, only the association of nymphs with adults on the same plant can unambiguously identify a plant as the host. Examination of collections indicates that only for very few collection events are nymphs preserved, probably because mirid nymphs do poorly as dry-pointed specimens. There is also the problem of correctly assigning nymphs to adults in the case of several Miridae species inhabiting the same plant. Because some species of the *Hadronema* group are associated with Meloidae (see below), an important question is whether plant records represent mirid or meloid hosts. Because species of Miridae are generally oligophagous (Wheeler, 2001), a great number of adult specimens on a single plant may indicate that this is an adequate host. Therefore, I assume throughout this paper that plant information repeated over several collection events, in addition to a great number of mirid specimens, is to be interpreted as a mirid host plant, not necessarily a meloid one.

Plant binomials from host-plant data were checked against the USDA-NRCS (2006)

TABLE 1
Measurements of Species of *Aoplonema*, *Aoplonemella*, *Daleapidea*, *Hadronema*, *Hadronemidea*, *Origonema*, and *Scutomiris*

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Aoplonema													
A. princeps													
Males (N=89)	**Mean**	**4.38**	**3.02**	**0.43**	**0.72**	**0.43**	**0.64**	**0.93**	**1.16**	**0.57**	**0.45**	**1.50**	-
	SD	0.34	0.17	0.04	0.04	0.05	0.08	0.03	0.09	0.06	0.03	0.11	-
	Range	1.54	0.73	0.19	0.16	0.24	0.39	0.15	0.37	0.23	0.13	0.56	-
	Min.	3.56	2.59	0.35	0.64	0.31	0.48	0.84	0.99	0.46	0.38	1.26	-
	Max.	5.10	3.33	0.54	0.80	0.55	0.86	1.00	1.36	0.69	0.51	1.82	-
Females (N=15)	**Mean**	**4.59**	**3.24**	**0.48**	**0.78**	**0.47**	**0.59**	**0.99**	**1.31**	**0.66**	**0.55**	**1.37**	-
	SD	0.21	0.15	0.04	0.04	0.03	0.07	0.04	0.09	0.04	0.02	0.11	-
	Range	0.69	0.50	0.14	0.17	0.11	0.21	0.16	0.30	0.12	0.11	0.37	-
	Min.	4.26	2.97	0.42	0.69	0.42	0.50	0.90	1.20	0.61	0.49	1.13	-
	Max.	4.95	3.47	0.56	0.86	0.52	0.71	1.06	1.50	0.73	0.59	1.50	-
A. rubrum n. sp.													
Males (N=12)	**Mean**	**5.55**	**3.49**	**0.39**	**0.73**	**0.50**	**1.00**	**0.94**	**1.26**	**0.66**	**0.41**	**1.60**	-
	SD	0.27	0.18	0.02	0.03	0.02	0.10	0.03	0.06	0.04	0.03	0.12	-
	Range	0.88	0.56	0.06	0.10	0.07	0.31	0.11	0.21	0.12	0.10	0.38	-
	Min.	5.11	3.16	0.35	0.67	0.47	0.86	0.88	1.18	0.61	0.36	1.37	-
	Max.	5.98	3.71	0.41	0.77	0.54	1.17	0.98	1.39	0.74	0.46	1.76	-
Females (N=12)	**Mean**	**4.51**	**3.14**	**0.44**	**0.74**	**0.48**	**0.60**	**0.97**	**1.37**	**0.69**	**0.52**	**1.20**	-
	SD	0.38	0.28	0.03	0.06	0.04	0.06	0.03	0.11	0.06	0.03	0.14	-
	Range	1.31	0.87	0.10	0.23	0.13	0.19	0.11	0.34	0.18	0.10	0.46	-
	Min.	3.84	2.78	0.40	0.61	0.42	0.53	0.92	1.23	0.60	0.48	1.00	-
	Max.	5.15	3.64	0.50	0.84	0.55	0.72	1.03	1.57	0.78	0.58	1.46	-
A. nigrum n. sp.													
Males (N=12)	**Mean**	**5.24**	**3.36**	**0.45**	**0.67**	**0.46**	**0.96**	**0.95**	**1.19**	**0.62**	**0.41**	**1.59**	-
	SD	0.23	0.13	0.02	0.03	0.03	0.06	0.03	0.04	0.04	0.02	0.10	-
	Range	0.76	0.48	0.08	0.11	0.09	0.22	0.10	0.12	0.17	0.06	0.32	-
	Min.	4.81	3.07	0.42	0.61	0.40	0.84	0.91	1.13	0.50	0.38	1.39	-
	Max.	5.57	3.56	0.50	0.72	0.49	1.06	1.01	1.25	0.68	0.44	1.71	-

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=12)	**Mean**	**4.82**	**3.33**	**0.50**	**0.73**	**0.48**	**0.70**	**1.02**	**1.30**	**0.69**	**0.56**	**1.22**	-
	SD	0.15	0.14	0.03	0.05	0.02	0.05	0.05	0.27	0.01	0.02	0.10	-
	Range	0.51	0.47	0.11	0.18	0.07	0.16	0.21	1.02	0.05	0.07	0.32	-
	Min.	4.61	3.12	0.46	0.61	0.45	0.63	0.95	0.44	0.66	0.53	1.04	-
	Max.	5.11	3.59	0.57	0.79	0.52	0.79	1.15	1.46	0.71	0.60	1.35	-
Aoplonemella festiva													
Males (N=12)	**Mean**	**2.91**	**1.98**	**0.29**	**0.56**	**0.27**	**0.39**	**0.67**	**0.95**	**0.42**	**0.39**	**0.90**	-
	SD	0.33	0.25	0.04	0.05	0.04	0.06	0.04	0.07	0.06	0.02	0.17	-
	Range	0.99	0.65	0.14	0.13	0.13	0.19	0.10	0.18	0.17	0.07	0.40	-
	Min.	2.53	1.73	0.24	0.50	0.22	0.30	0.61	0.85	0.34	0.35	0.70	-
	Max.	3.52	2.38	0.37	0.63	0.36	0.48	0.72	1.03	0.51	0.42	1.10	-
Females (N=16)	**Mean**	**3.40**	**2.35**	**0.34**	**0.64**	**0.32**	**0.43**	**0.72**	**1.14**	**0.52**	**0.45**	**0.73**	-
	SD	0.42	0.27	0.04	0.07	0.04	0.08	0.05	0.11	0.06	0.04	0.12	-
	Range	1.33	0.77	0.16	0.26	0.15	0.24	0.19	0.34	0.16	0.13	0.41	-
	Min.	2.55	1.89	0.24	0.49	0.24	0.30	0.61	0.94	0.43	0.37	0.54	-
	Max.	3.88	2.66	0.40	0.75	0.39	0.54	0.80	1.28	0.59	0.50	0.95	-
Daleapidea													
D. albescens													
Males (N=)	**Mean**	**3.99**	**2.76**	**0.35**	**0.73**	**0.40**	**0.55**	**0.88**	**1.11**	**0.52**	**0.48**	**1.50**	-
	SD	0.10	0.08	0.04	0.02	0.01	0.04	0.02	0.03	0.03	0.02	0.01	-
	Range	0.24	0.21	0.09	0.06	0.02	0.08	0.04	0.07	0.08	0.05	0.03	-
	Min.	3.82	2.64	0.31	0.71	0.39	0.50	0.86	1.07	0.47	0.44	1.48	-
	Max.	4.05	2.86	0.40	0.77	0.41	0.59	0.90	1.14	0.54	0.50	1.52	-
Females (N=5)	**Mean**	**4.54**	**3.22**	**0.43**	**0.86**	**0.45**	**0.62**	**0.97**	**1.42**	**0.66**	**0.53**	**1.15**	-
	SD	0.19	0.07	0.03	0.03	0.03	0.06	0.01	0.04	0.05	0.02	0.08	-
	Range	0.47	0.19	0.08	0.07	0.08	0.16	0.03	0.08	0.12	0.04	0.19	-
	Min.	4.22	3.13	0.38	0.83	0.42	0.51	0.95	1.38	0.61	0.51	1.04	-
	Max.	4.69	3.32	0.46	0.90	0.49	0.67	0.98	1.46	0.73	0.55	1.23	-
D. daleae													
Males (N=5)	**Mean**	**4.39**	**3.15**	**0.45**	**0.82**	**0.45**	**0.61**	**0.98**	**1.31**	**0.66**	**0.50**	**1.97**	-
	SD	0.17	0.11	0.02	0.03	0.02	0.02	0.03	0.03	0.05	0.01	0.09	-
	Range	0.42	0.24	0.06	0.06	0.04	0.06	0.07	0.07	0.12	0.04	0.22	-
	Min.	4.17	3.04	0.42	0.78	0.43	0.58	0.95	1.28	0.57	0.48	1.88	-
	Max.	4.59	3.28	0.49	0.85	0.47	0.64	1.01	1.35	0.69	0.52	2.10	-

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=5)	**Mean**	**4.58**	**3.29**	**0.42**	**0.89**	**0.50**	**0.61**	**1.01**	**1.53**	**0.75**	**0.54**	**1.27**	-
	SD	0.13	0.03	0.04	0.04	0.03	0.03	0.04	0.04	0.02	0.01	0.06	-
	Range	0.32	0.09	0.09	0.09	0.08	0.06	0.10	0.11	0.06	0.04	0.15	-
	Min.	4.40	3.25	0.38	0.84	0.45	0.57	0.96	1.47	0.71	0.52	1.21	-
	Max.	4.72	3.34	0.48	0.93	0.53	0.64	1.06	1.58	0.77	0.55	1.36	-
D. decorata													
Males (N=5)	**Mean**	**4.02**	**2.78**	**0.38**	**0.74**	**0.44**	**0.59**	**0.88**	**1.16**	**0.54**	**0.48**	**1.58**	-
	SD	0.21	0.12	0.03	0.04	0.02	0.04	0.03	0.07	0.02	0.02	0.05	-
	Range	0.52	0.27	0.07	0.09	0.05	0.10	0.08	0.14	0.06	0.04	0.13	-
	Min.	3.78	2.65	0.36	0.70	0.41	0.55	0.85	1.09	0.52	0.46	1.53	-
	Max.	4.31	2.92	0.42	0.79	0.46	0.65	0.92	1.23	0.57	0.49	1.66	-
Females (N=5)	**Mean**	**4.65**	**3.39**	**0.50**	**0.88**	**0.54**	**0.59**	**0.97**	**1.49**	**0.73**	**0.55**	**1.34**	-
	SD	0.13	0.09	0.04	0.06	0.02	0.03	0.02	0.05	0.02	0.02	0.06	-
	Range	0.33	0.21	0.09	0.15	0.04	0.09	0.05	0.12	0.05	0.05	0.15	-
	Min.	4.48	3.28	0.45	0.78	0.53	0.54	0.95	1.42	0.70	0.53	1.25	-
	Max.	4.81	3.49	0.54	0.93	0.57	0.62	1.00	1.54	0.75	0.58	1.39	-
Hadronema													
H. bispinosum													
Males (N=5)	**Mean**	**3.24**	**2.29**	**0.32**	**0.57**	**0.32**	**0.43**	**0.81**	**0.97**	**0.47**	**0.46**	**0.85**	**0.76**
	SD	0.19	0.07	0.03	0.03	0.01	0.04	0.03	0.03	0.04	0.02	0.02	0.06
	Range	0.52	0.17	0.06	0.07	0.03	0.11	0.08	0.08	0.09	0.05	0.04	0.11
	Min.	3.03	2.22	0.30	0.54	0.31	0.36	0.79	0.95	0.44	0.44	0.82	0.70
	Max.	3.55	2.40	0.36	0.61	0.34	0.47	0.87	1.03	0.53	0.49	0.87	0.82
Females (N=5)	**Mean**	**3.96**	**2.76**	**0.45**	**0.66**	**0.39**	**0.51**	**0.89**	**1.20**	**0.60**	**0.54**	**0.90**	**0.81**
	SD	3.86	2.76	0.42	0.69	0.42	0.56	0.91	1.23	0.60	0.55	0.86	0.86
	Range	4.19	2.92	0.42	0.71	0.41	0.51	0.92	1.29	0.69	0.55	0.97	0.88
	Min.	3.68	2.65	0.38	0.59	0.42	0.52	0.92	1.18	0.58	0.55	0.89	0.83
	Max.	3.65	2.57	0.41	0.62	0.37	0.48	0.86	1.13	0.55	0.53	0.89	0.79
H. breviatum													
Males (N=2)	**Mean**	**2.69**	**1.89**	**0.35**	**0.46**	**0.27**	**0.32**	**0.74**	**0.88**	**0.41**	**0.40**	**0.67**	**0.53**
	SD	0.13	0.12	0.01	0.04	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.07
	Range	0.18	0.17	0.01	0.05	0.01	0.01	0.01	0.02	0.00	0.00	0.00	0.10
	Min.	2.60	1.81	0.34	0.44	0.27	0.32	0.74	0.87	0.41	0.40	0.67	0.48
	Max.	2.78	1.98	0.36	0.49	0.28	0.33	0.74	0.89	0.41	0.40	0.67	0.58

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=5)	**Mean**	**3.03**	**2.14**	**0.37**	**0.52**	**0.31**	**0.36**	**0.81**	**1.01**	**0.45**	**0.47**	**0.65**	**0.52**
	SD	0.17	0.10	0.04	0.02	0.05	0.06	0.02	0.05	0.06	0.02	0.04	0.03
	Range	0.39	0.23	0.10	0.06	0.13	0.16	0.05	0.13	0.15	0.04	0.09	0.07
	Min.	2.83	1.97	0.33	0.49	0.24	0.27	0.77	0.94	0.35	0.45	0.61	0.49
	Max.	3.21	2.20	0.42	0.55	0.37	0.44	0.82	1.07	0.50	0.49	0.70	0.56
H. incognitum n. sp.													
Males (N=6)	**Mean**	**3.95**	**2.76**	**0.39**	**0.67**	**0.42**	**0.48**	**0.91**	**1.06**	**0.56**	**0.52**	**1.16**	**0.98**
	SD	0.17	0.13	0.04	0.04	0.02	0.05	0.03	0.05	0.03	0.02	0.06	0.05
	Range	0.45	0.35	0.10	0.11	0.04	0.14	0.06	0.12	0.09	0.05	0.18	0.15
	Min.	3.73	2.57	0.34	0.63	0.40	0.39	0.88	1.01	0.52	0.49	1.04	0.90
	Max.	4.17	2.93	0.44	0.74	0.44	0.53	0.94	1.13	0.61	0.55	1.22	1.05
Females (N=5)	**Mean**	**4.63**	**3.29**	**0.47**	**0.77**	**0.50**	**0.56**	**0.98**	**1.35**	**0.68**	**0.60**	**1.18**	**0.95**
	SD	0.25	0.18	0.04	0.05	0.03	0.03	0.04	0.06	0.03	0.02	0.09	0.11
	Range	0.65	0.49	0.11	0.14	0.08	0.08	0.11	0.14	0.09	0.04	0.22	0.27
	Min.	4.36	3.06	0.44	0.70	0.46	0.53	0.94	1.30	0.64	0.59	1.05	0.81
	Max.	5.01	3.55	0.54	0.84	0.53	0.60	1.05	1.44	0.73	0.63	1.27	1.08
H. mexicanum n. sp.													
Males (N=10)	**Mean**	**3.35**	**2.34**	**0.32**	**0.60**	**0.35**	**0.44**	**0.81**	**1.05**	**0.51**	**0.47**	**0.87**	**0.76**
	SD	0.11	0.05	0.02	0.02	0.03	0.04	0.03	0.05	0.02	0.02	0.06	0.08
	Range	0.35	0.13	0.08	0.05	0.08	0.15	0.10	0.15	0.09	0.05	0.22	0.23
	Min.	3.19	2.28	0.28	0.58	0.30	0.36	0.75	0.96	0.47	0.45	0.75	0.67
	Max.	3.55	2.41	0.36	0.63	0.38	0.51	0.85	1.11	0.56	0.50	0.97	0.90
Females (N=9)	**Mean**	**3.77**	**2.72**	**0.41**	**0.67**	**0.42**	**0.43**	**0.88**	**1.23**	**0.61**	**0.54**	**0.91**	**0.76**
	SD	0.17	0.11	0.03	0.03	0.03	0.06	0.02	0.04	0.03	0.02	0.05	0.04
	Range	0.53	0.28	0.09	0.08	0.09	0.18	0.07	0.10	0.09	0.06	0.14	0.12
	Min.	3.61	2.56	0.36	0.62	0.36	0.33	0.85	1.16	0.57	0.51	0.87	0.71
	Max.	4.14	2.84	0.45	0.70	0.44	0.51	0.93	1.26	0.66	0.57	1.01	0.83
H. militare													
Males (N=5)	**Mean**	**4.39**	**3.08**	**0.42**	**0.72**	**0.46**	**0.53**	**0.97**	**1.24**	**0.63**	**0.57**	**1.25**	**0.97**
	SD	0.07	0.04	0.03	0.03	0.02	0.02	0.02	0.04	0.02	0.02	0.08	0.09
	Range	0.14	0.12	0.06	0.06	0.04	0.05	0.06	0.10	0.06	0.04	0.16	0.23
	Min.	4.31	3.02	0.38	0.70	0.43	0.51	0.93	1.17	0.60	0.55	1.18	0.85
	Max.	4.45	3.14	0.44	0.76	0.47	0.55	0.98	1.27	0.66	0.59	1.35	1.08

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=5)	**Mean**	**5.11**	**3.67**	**0.56**	**0.83**	**0.56**	**0.62**	**1.10**	**1.55**	**0.77**	**0.70**	**1.37**	**1.03**
	SD	0.09	0.13	0.02	0.04	0.03	0.05	0.03	0.10	0.05	0.03	0.11	0.06
	Range	0.20	0.29	0.06	0.08	0.08	0.12	0.08	0.24	0.13	0.07	0.25	0.17
	Min.	5.02	3.54	0.53	0.79	0.53	0.55	1.06	1.44	0.71	0.66	1.19	0.96
	Max.	5.22	3.82	0.59	0.87	0.61	0.67	1.14	1.68	0.83	0.73	1.44	1.12
H. pictum													
Males (N=10)	**Mean**	**3.20**	**2.20**	**0.31**	**0.57**	**0.34**	**0.42**	**0.77**	**1.02**	**0.49**	**0.44**	**0.81**	**0.78**
	SD	0.12	0.11	0.04	0.04	0.03	0.05	0.04	0.03	0.05	0.02	0.05	0.06
	Range	0.41	0.40	0.12	0.12	0.09	0.15	0.10	0.11	0.14	0.07	0.16	0.18
	Min.	2.95	1.93	0.25	0.50	0.28	0.33	0.73	0.96	0.40	0.40	0.70	0.67
	Max.	3.35	2.33	0.37	0.62	0.37	0.48	0.83	1.06	0.55	0.47	0.86	0.85
Females (N=10)	**Mean**	**3.79**	**2.72**	**0.41**	**0.70**	**0.40**	**0.43**	**0.88**	**1.24**	**0.59**	**0.53**	**0.85**	**0.79**
	SD	0.20	0.08	0.03	0.04	0.02	0.05	0.02	0.05	0.03	0.02	0.04	0.04
	Range	0.62	0.25	0.09	0.12	0.06	0.14	0.08	0.17	0.10	0.07	0.16	0.15
	Min.	3.54	2.62	0.36	0.65	0.37	0.37	0.84	1.16	0.56	0.48	0.77	0.73
	Max.	4.16	2.87	0.45	0.77	0.43	0.51	0.92	1.33	0.65	0.55	0.93	0.88
H. simplex													
Males (N=7)	**Mean**	**3.38**	**2.36**	**0.34**	**0.57**	**0.34**	**0.40**	**0.83**	**1.02**	**0.51**	**0.47**	**0.92**	**0.79**
	SD	0.23	0.10	0.02	0.04	0.02	0.05	0.02	0.05	0.02	0.01	0.06	0.08
	Range	0.70	0.35	0.05	0.11	0.06	0.17	0.07	0.15	0.05	0.04	0.18	0.24
	Min.	2.90	2.19	0.32	0.51	0.31	0.34	0.79	0.95	0.47	0.45	0.83	0.63
	Max.	3.60	2.54	0.37	0.63	0.37	0.51	0.86	1.10	0.52	0.49	1.01	0.87
Females (N=7)	**Mean**	**3.91**	**2.86**	**0.42**	**0.67**	**0.43**	**0.43**	**0.91**	**1.22**	**0.61**	**0.56**	**0.96**	**0.79**
	SD	0.14	0.10	0.02	0.05	0.03	0.05	0.02	0.05	0.03	0.02	0.03	0.05
	Range	0.39	0.29	0.05	0.13	0.08	0.17	0.04	0.13	0.10	0.06	0.08	0.13
	Min.	3.76	2.64	0.40	0.59	0.38	0.33	0.89	1.15	0.56	0.53	0.91	0.73
	Max.	4.14	2.93	0.44	0.72	0.46	0.49	0.93	1.28	0.66	0.59	0.99	0.86
H. sinuatum													
Males (N=5)	**Mean**	**3.29**	**2.36**	**0.37**	**0.57**	**0.31**	**0.37**	**0.84**	**0.97**	**0.43**	**0.46**	**0.94**	**0.76**
	SD	0.13	0.11	0.01	0.02	0.06	0.04	0.02	0.03	0.05	0.02	0.02	0.11
	Range	0.30	0.26	0.04	0.05	0.15	0.10	0.04	0.06	0.13	0.05	0.05	0.28
	Min.	3.13	2.20	0.35	0.55	0.23	0.33	0.82	0.93	0.37	0.44	0.91	0.62
	Max.	3.43	2.46	0.39	0.60	0.38	0.43	0.87	1.00	0.50	0.49	0.96	0.89

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=5)	**Mean**	**3.84**	**2.73**	**0.45**	**0.63**	**0.38**	**0.40**	**0.91**	**1.14**	**0.55**	**0.53**	**0.88**	**0.80**
	SD	0.07	0.04	0.02	0.03	0.02	0.04	0.02	0.04	0.01	0.02	0.03	0.04
	Range	0.15	0.09	0.05	0.08	0.04	0.09	0.04	0.10	0.03	0.05	0.08	0.10
	Min.	3.76	2.70	0.42	0.58	0.36	0.38	0.90	1.11	0.53	0.51	0.85	0.75
	Max.	3.91	2.78	0.47	0.66	0.40	0.46	0.94	1.20	0.57	0.57	0.92	0.85
Hadronemidea													
H. echinata													
Males (N=5)	**Mean**	**5.23**	**3.87**	**0.56**	**0.93**	**0.48**	**0.67**	**1.00**	**1.57**	**0.72**	**0.62**	**2.47**	-
	SD	0.25	0.12	0.03	0.07	0.03	0.09	0.03	0.10	0.02	0.03	0.11	-
	Range	0.57	0.29	0.08	0.16	0.08	0.21	0.08	0.25	0.05	0.07	0.29	-
	Min.	4.95	3.77	0.52	0.87	0.43	0.60	0.96	1.41	0.70	0.58	2.31	-
	Max.	5.52	4.06	0.60	1.03	0.50	0.81	1.04	1.65	0.74	0.66	2.60	-
Females (N=5)	**Mean**	**5.86**	**4.39**	**0.60**	**1.08**	**0.55**	**0.75**	**1.05**	**1.79**	**0.81**	**0.66**	**2.13**	-
	SD	0.45	0.28	0.07	0.07	0.04	0.10	0.05	0.13	0.06	0.03	0.14	-
	Range	1.25	0.72	0.14	0.18	0.09	0.26	0.15	0.35	0.17	0.08	0.32	-
	Min.	5.28	4.04	0.51	0.98	0.49	0.59	0.98	1.59	0.73	0.61	2.00	-
	Max.	6.53	4.76	0.65	1.15	0.59	0.85	1.12	1.94	0.89	0.69	2.31	-
H. esau													
Males (N=3)	**Mean**	**5.48**	**3.91**	**0.45**	**0.97**	**0.48**	**0.68**	**1.04**	**1.68**	**0.68**	**0.59**	**2.26**	-
	SD	0.11	0.15	0.12	0.04	0.06	0.14	0.03	0.04	0.07	0.02	0.22	-
	Range	0.21	0.26	0.21	0.08	0.10	0.27	0.05	0.08	0.13	0.03	0.31	-
	Min.	5.35	3.82	0.31	0.94	0.44	0.56	1.01	1.64	0.59	0.58	2.10	-
	Max.	5.56	4.08	0.52	1.02	0.54	0.83	1.06	1.72	0.72	0.61	2.41	-
Females (N=5)	**Mean**	**5.64**	**4.25**	**0.54**	**0.97**	**0.56**	**0.72**	**1.10**	**1.77**	**0.80**	**0.68**	**1.91**	-
	SD	0.43	0.25	0.06	0.05	0.04	0.08	0.03	0.09	0.06	0.03	0.09	-
	Range	1.12	0.66	0.13	0.12	0.10	0.23	0.08	0.21	0.15	0.07	0.22	-
	Min.	5.21	3.99	0.48	0.93	0.53	0.61	1.08	1.64	0.72	0.66	1.75	-
	Max.	6.34	4.64	0.62	1.05	0.62	0.84	1.16	1.85	0.87	0.73	1.98	-
Origonema splendida													
Males (N=4)	**Mean**	**3.05**	**2.16**	**0.29**	**0.61**	**0.33**	**0.43**	**0.76**	**1.01**	**0.47**	**0.39**	**1.01**	-
	SD	0.14	0.05	0.03	0.03	0.04	0.06	0.03	0.02	0.02	0.02	0.06	-
	Range	0.32	0.10	0.06	0.07	0.09	0.12	0.07	0.05	0.04	0.04	0.15	-
	Min.	2.87	2.11	0.27	0.58	0.29	0.37	0.72	0.98	0.46	0.37	0.94	-
	Max.	3.19	2.21	0.33	0.65	0.37	0.48	0.79	1.03	0.49	0.41	1.09	-

TABLE 1
(Continued)

Species		Length						Width					
		Total	Cun-Clyp	Head	Pron	Scut	Cuneus	Head	Pron	Scut	IntOcDi	Ant2	Ant3
Females (N=5)	**Mean**	**3.35**	**2.42**	**0.31**	**0.64**	**0.38**	**0.45**	**0.80**	**1.19**	**0.57**	**0.45**	**0.91**	-
	SD	0.11	0.06	0.01	0.02	0.04	0.03	0.02	0.03	0.06	0.03	0.06	-
	Range	0.29	0.16	0.04	0.06	0.09	0.08	0.06	0.07	0.20	0.09	0.19	-
	Min.	3.19	2.36	0.29	0.61	0.33	0.42	0.76	1.16	0.46	0.39	0.82	-
	Max.	3.48	2.53	0.33	0.67	0.42	0.50	0.82	1.23	0.65	0.48	1.01	-
Scutomiris setosus													
Males (N=5)	**Mean**	**3.25**	**2.26**	**0.29**	**0.57**	**0.43**	**0.44**	**0.74**	**1.01**	**0.47**	**0.39**	**1.28**	-
	SD	0.16	0.10	0.02	0.04	0.04	0.05	0.04	0.10	0.03	0.03	0.08	-
	Range	0.36	0.23	0.06	0.11	0.11	0.14	0.09	0.25	0.07	0.07	0.21	-
	Min.	3.09	2.14	0.25	0.53	0.37	0.36	0.72	0.87	0.44	0.36	1.17	-
	Max.	3.45	2.37	0.31	0.63	0.48	0.49	0.81	1.12	0.51	0.43	1.37	-
Females (N=5)	**Mean**	**3.26**	**2.35**	**0.30**	**0.58**	**0.43**	**0.42**	**0.78**	**1.09**	**0.49**	**0.42**	**1.04**	-
	SD	0.16	0.10	0.02	0.03	0.02	0.03	0.03	0.05	0.04	0.02	0.06	-
	Range	0.40	0.22	0.05	0.09	0.07	0.08	0.07	0.14	0.08	0.05	0.17	-
	Min.	3.04	2.23	0.28	0.54	0.40	0.37	0.72	1.01	0.44	0.39	0.94	-
	Max.	3.44	2.45	0.32	0.63	0.47	0.45	0.80	1.15	0.52	0.43	1.11	-

Antennal segment 3 was measured only for *Hadronema*. Cun, cuneus; Clyp, clypeus; Pron, pronotum; Scut, scutellum; IntOcDi, interocular distance; Ant2, antennal segment 2; Ant3, antennal segment 3.

PLANTS database for updated synonymies and higher rank placement. The only exception is *Sarcobatus*, which is considered to belong to its own family, Sarcobataceae (Behnke, 1997), as argued by Cuénoud et al. (2002) and Kadereit et al. (2003).

Distribution maps were generated with ArcMap 9.1 (ESRI, 2005), using a shaded relief map for North America (Paskevich, 2005). In order to generate the maps, label data were georeferenced with GEOLocate (Rios and Bart, 2005) and with available gazetteers (e.g., Geographic Names Information System, USGS, 2007). Accuracy of geographic decimal degree coordinates follows that of gazetteers. When locality data were ambiguous, no georeference was entered in the PBI database, and the locality was not plotted in the maps but listed under "Material Examined".

When listing holotypes, all interpolated data, in particular geographical coordinates, are placed within square brackets. For other material, no distinction is made for interpolated data.

To avoid repetition under species descriptions, those characters not mentioned are invariant and are regarded as the same as in the associated generic description (e.g., the type of vestiture). All measurements given are in millimeters unless otherwise stated.

ON THE GENDER OF THE NAMES

Article 31.2. of the International Code of Zoological Nomenclature (ICZN, 1999) states that a species group name should agree in gender with the generic name. Uhler (1872) did not specify the derivation for *Hadronema*. The specific epithet in *H. militaris*, the type species, could be either masculine or feminine. "*Hadronema*" names were subsequently usually treated as feminine (e.g., Uhler 1894, 1895), except in recent literature (e.g., Henry and Wheeler, 1988; Wheeler, 2001). Steyskal (1973), while making emendations to several Miridae names, indicated that *Hadronema* species should be considered as neuter. Schuh (1989) disregarded Steyskal's (1973) emendation for *Hadronema decorata*—among other Miridae names—due to the uncertainty about the etymology of *Hadronema*. Nevertheless, assuming a Greek ending for *Hadronema* as pointed out by article 26 of the ICZN, *-nema* is to be considered neuter as exemplified by article 30.1.2. *Aoplonema* has the same suffix, and without a clear etymology it is therefore also treated as neuter in gender, even when the specific epithet of its type species, *Hadronema princeps*, can modify masculine, feminine, or neuter nouns. *Daleapidea* is treated here as feminine following Knight's original usage, as well as *Hadronemidea*, due to its Latin feminine suffix.

LECTOTYPE DESIGNATIONS

The ICZN (1999) requires after 1999 that in order to validate lectotype designations, the researcher has to employ the term "lectotype" each time a specimen is designed as such (74.7.1.), include explicit information about the specimen being designated (74.7.2.), and contain an express statement of deliberate designation (74.7.3.). The first two conditions are met under each lectotype designation. For the third condition, it is herein stated that the purpose of all lectotype designations made is to ensure taxonomic stability of the species concept of the taxon under consideration (see also Pulawski et al., 2002; ICZN, 2007).

HADRONEMA GENUS GROUP

DIAGNOSIS: Recognized by the presence of a supragenital bridge (figs. 6, 16, 21, 26, 28, 29, 39, 43); a hatchet-shaped right paramere with long subparallel body; a dorsal medial tubercle on the right paramere with flattened apex, ranging from rounded to truncate, and directed medially (figs. 4E, 6, 15E, 16, 20F, 21, 24C, 26, 28, 29, 37E, 39, 42E, 43, 45E); right paramere usually inserted slightly above left (figs. 4E, 15E, 20F, 37E, 42E, 45E); left paramere usually sickle-shaped, with a small acute process projecting ventrad at the apex; a sensory area of long setae on middorsal surface of left paramere; and body of left paramere without any processes or protuberances (figs. 6, 16, 21, 26, 28, 29, 39, 43).

DISCUSSION: The *Hadronema* group comprises the previously described genera *Aoplonema*, *Daleapidea*, *Hadronema*, *Hadronemidea*, and the newly described *Aoplonemella*,

Origonema, and *Scutomiris*. The most distinctive character shared by the members of this group is the supragenital bridge. This structure unequivocally identifies members of the *Hadronema* group in North America among Orthotylini. Outside North America it is not known exactly how many other Orthotylini exhibit this character because the genital capsule is usually not illustrated or discussed (e.g., Carvalho and Schaffner, 1973; Gruetzmacher and Schaffner, 1977; Carvalho, 1983, 1985) unless there are conspicuous processes on its aperture (e.g., Stonedahl and Schuh, 1986; Stonedahl and Schwartz, 1988; Schwartz, 2004). Only two other orthotyline taxa are known to possess a supragenital bridge. In the Neotropics, *Araucanocoris* Carvalho (as discussed below) has a developed supragenital bridge, although not all the included species exhibit this character. In the Austro-Papuan region, species of *Sagittacopula* Wall also possess a supragenital bridge (Wall, 2007), but this genus is not related with the *Hadronema* group (see phylogenetic discussion).

The taxa comprising the *Hadronema* group also share similar host-plant associations. Many of the species feed or breed mainly on Fabaceae and Asteraceae, although other host-plant associations may occur. It is also noteworthy that some of the species of the group have been associated with meloid beetles or cantharidin traps (e.g., Pinto, 1978), a rare association for the Miridae (Wheeler, 2001).

Key to Genera of the *Hadronema* Group

1. First antennal segment in male not subbasally thickened, nearly cylindrical (figs. 1, 3, 4A, 15A, 24A, 42A, 45A); protibia nearly cylindrical, neither with such a flattened ventral surface (e.g., fig. 15F) nor with an enlarged setae apically; male with genital capsule not elongate, subtriangular, or subquadrangular (figs. 6, 15E, 24C–E, 28, 29, 39, 43) 2
— First antennal segment in male subbasally thickened (figs. 2, 20A); protibia with a flat ventral surface covered with enlarged spinelike setae on its margin (fig. 20C), less pronounced in female; male with elongate genital capsule (figs. 20F, 21). . . *Daleapidea*
2. Disc of scutellum flat, not swollen; vestiture composed of shorter, simple setae, with or without sericeous setae on dorsum 3
— Disc of scutellum swollen (fig. 45F); vestiture composed of long, simple setae intermixed with sericeous setae on dorsum (fig. 45D) . . . . . *Scutomiris*, gen. nov.
3. Vestiture composed of simple setae only (figs. 15D, 24F, 37D, 42D). 4
— Vestiture with two kinds of setae, decumbent simple setae intermixed with sericeous setae (fig. 4D) . . . . . *Aoplonema*
4. Frons not strongly convex (figs. 24A, 37A, 38A, 42A); vestiture composed of bristlelike setae (figs. 24F, 37D, 42D); vesica composed of two spicules, one short and one long (figs. 26, 27, 29, 39, 43) 5
— Frons strongly convex (fig. 15A); vestiture composed of decumbent short setae (fig. 15D); vesica composed of a single unornamented spiculum (fig. 17). . . . . *Aoplonemella*, gen. nov.
5. First tarsal segment of forelegs of male expanded (fig. 25A, C), ventral surface beset with numerous tenent setae (figs. 25E, F, 38C). 6
— First tarsal segment of forelegs of male not expanded, cylindrical, ventral surface with simple setae . . . . . *Origonema*, gen. nov.
6. Eyes adjacent to the anterior margin of the pronotum (figs. 2, 3, 24A); profemur of male with a basal bifid tubercle projecting ventrad (fig. 25D); mesotibia of male nearly straight. . . . . *Hadronema*
— Eyes removed from the anterior margin of the pronotum (figs. 37A, 38A); profemur of male nearly cylindrical, without any process or protuberance; mesotibia of male curved (figs. 37F, 38B) . . . . . *Hadronemidea*

Aoplonema Knight

Type species: *Hadronema princeps* Uhler, 1894 (by original designation).

Hadronema (*Aoplonema*) Knight, 1928: 177 [n. subgen.]; Carvalho, 1958: 68 [catalog]; Henry and Wheeler, 1988: 410 [catalog].

Aoplonema: Kerzhner and Schuh, 1995: 4 [revised status]; Schuh, 1995: 81 [catalog].

DIAGNOSIS: Recognized by the overall reddish coloration (fig. 1), the narrow, almost delicate body (fig. 1), the vestiture composed of simple decumbent and sericeous setae (fig. 4D), the cylindrical phallotheca with a basal enlargement on the left side (figs. 6, 7), and the vesica with a single deeply cleft spicule forming two portions, with the

Fig. 1. Habitus views of *Aoplonema* and *Aoplonemella*. Letters (**A–F**) in *A. princeps* indicate color variation (see text for details). *Aoplonemella festiva*, showing length and color variation.

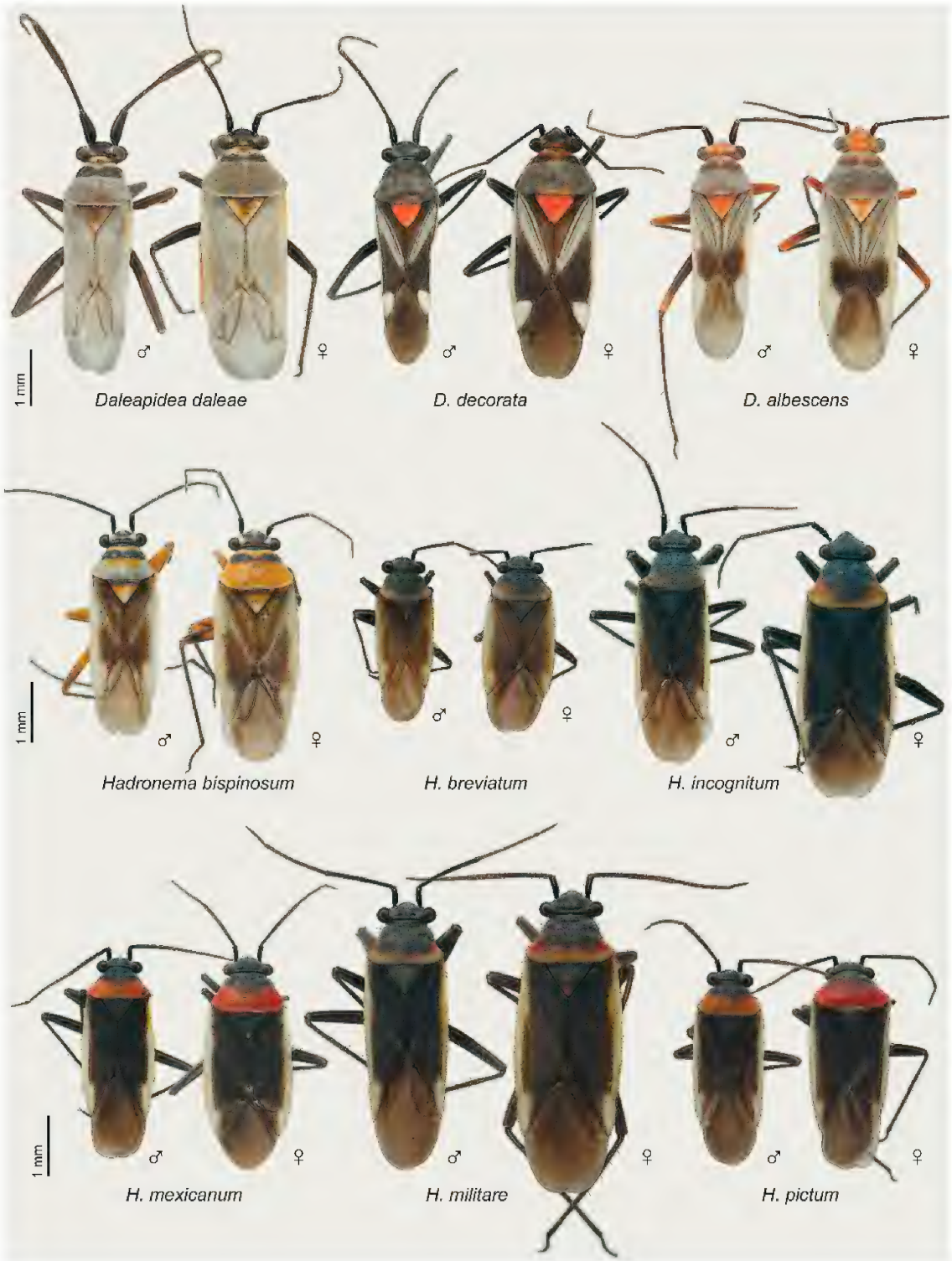


Fig. 2. Habitus views of *Daleapidea* and *Hadronema bispinosum–H. pictum*.

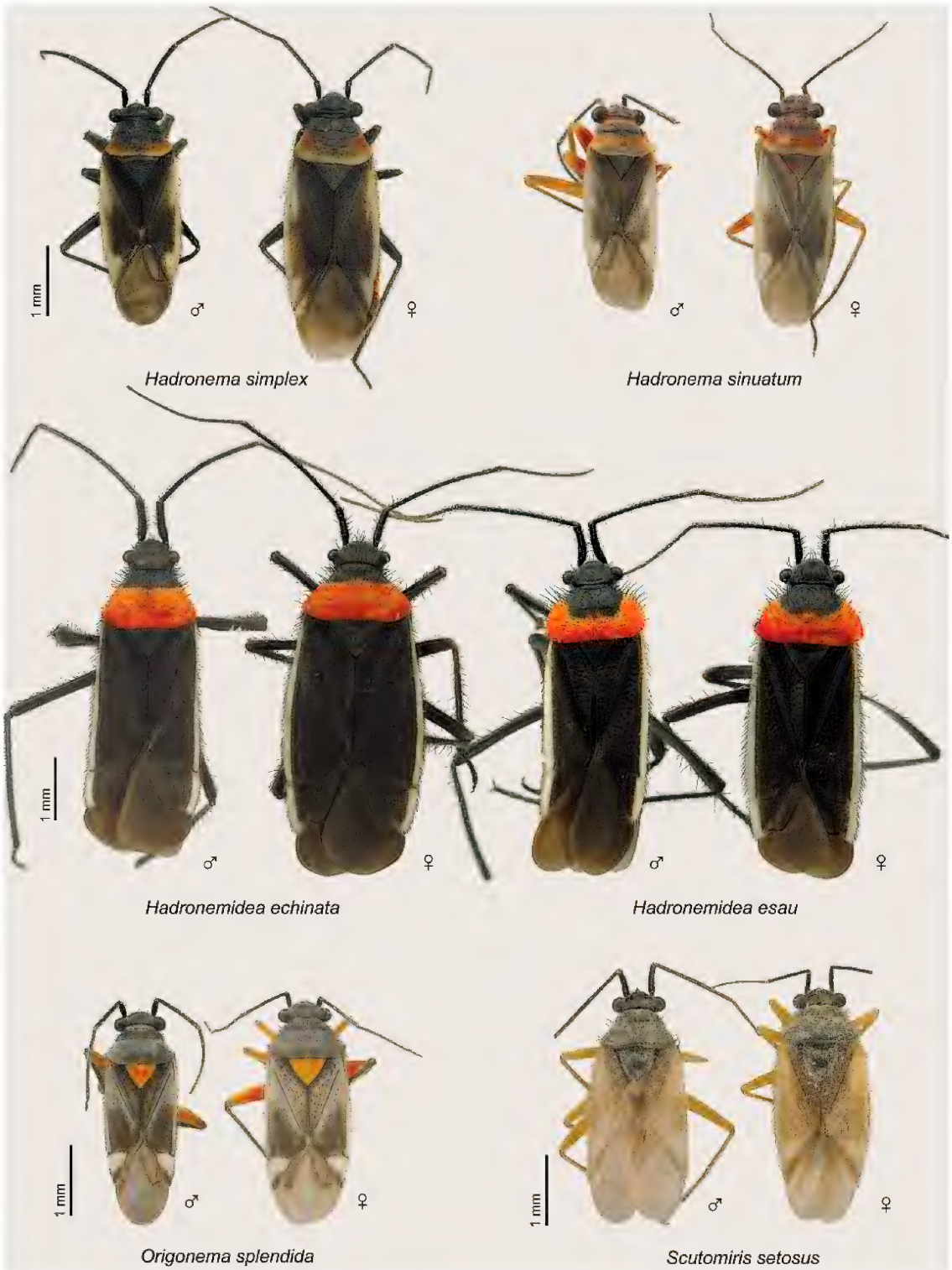


Fig. 3. Habitus views of *Hadronema simplex–H. sinuatum*, *Hadronemidea*, *Origonema*, and *Scutomiris*.

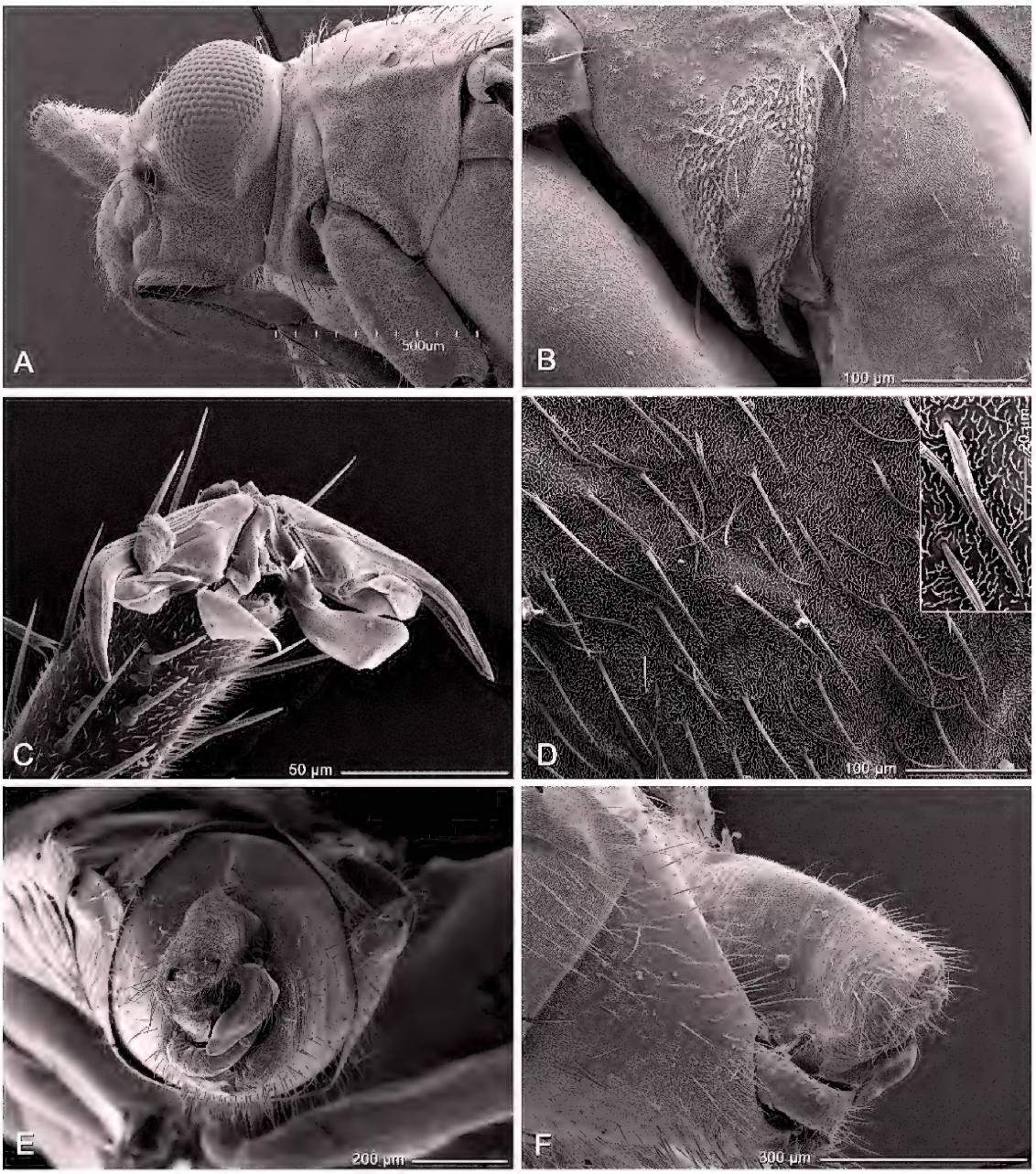


Fig. 4. *Aoplonema princeps*. **A**. Lateral view of head and pronotum. **B**. Metepisternum showing evaporatory area and peritreme. **C**. Pretarsus. **D**. Vestiture on hemelytron, with inset of detailed sericeous setae. **E**. Genital capsule, posterior view. **F**. Genital capsule, lateral view.

left portion apically with two cephalad-directed rami (figs. 7, 10, 13).

Aoplonema is easily distinguished from other taxa of the *Hadronema* group by the particular type of vestiture, the presence of a single deeply cleft spicule of the vesica, and by the striking red and black overall coloration. It resembles *Scutomiris* in having two types of setae on the dorsum, simple structure of legs, convex frons, long dorsal opening of

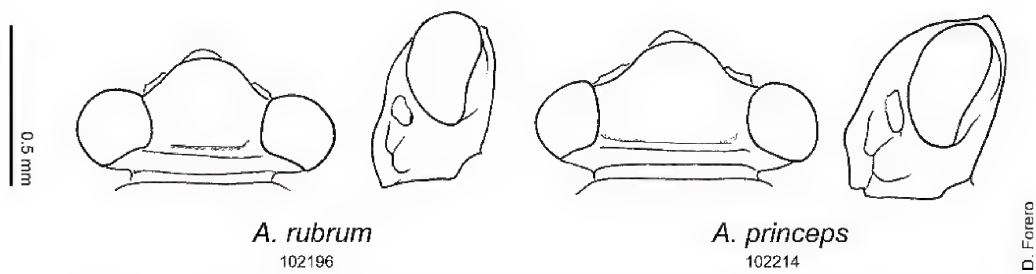


Fig. 5. *Aoplonema rubrum* and *A. princeps*. Dorsal and lateral views of male heads.

the phallotheca, and basal left protuberance on phallotheca; it is distinguished by the shorter and more decumbent simple setae on dorsum, the noninflated scutellum, and a single deeply cleft spicule of the vesica. Similar also to *Aoplonemella* in having a convex frons and simple structure of the legs, but easily distinguished by the vestiture with sericeous setae and by the vesica with one spicule with two portions, the left one with two rami.

REDESCRIPTION: *Male:* Usually delicate species, elongate, medium to large, total length 3.56–5.98. COLORATION: Red with dark areas and pale markings on hemelytra (fig. 1). HEAD: Reddish black. THORAX: Pronotum reddish black, sometimes almost orange. *Hemelytra:* Dark brown with pale costal margins, sometimes whitish cuneus with reddish markings. *Legs:* Red, reddish black, or dark brown. ABDOMEN: Reddish black. SURFACE AND VESTITURE: Surface smooth, dull, beset with dense macrotrichia; dorsum covered with simple short decumbent or semidecumbent setae, intermixed with sericeous setae (fig. 4D). STRUCTURE: HEAD (fig. 4A): Transverse, gently to strongly declivent, from oval to nearly oblong in lateral view; anteocular region short, less than one-third of head length, sometimes about one-third head length (fig. 5), beset with short simple setae; clypeus weakly protruding basally, barely visible in dorsal view, with one medial and two lateral longitudinal areas of irregular shiny spots; frons rounded to nearly flat, with two longitudinal ovate areas of irregular small shiny spots; vertex nearly flat, weakly excavated, with paired dark dull areas next to eyes; transverse carina elevated, not impressed, with a row of suberect simple setae; mandibular and maxillary plates subquadrangular, occupying about half the height of head, apices rounded; buccula not expanded laterally, beset with short or medium-sized simple setae; gena with scattered medium-sized simple setae below eye, vertical longitudinal patch of simple setae adjacent to base of maxillary plate; gula small, shorter than length of buccula, sometimes about as long as buccula; eyes oval in lateral view, rounded in dorsal view, from large to medium-sized, usually surpassing dorsal margin of head in lateral view, sometimes barely reaching dorsal margin, in dorsal view adjacent to anterior margin of pronotum; labrum narrow, acute, shorter than buccula; labium barely surpassing mesocoxa, beset with short setae, segment I dull, II–IV shiny; antennal segment I barely greater in diameter than II, II and III of subequal diameter, IV with the smallest diameter, segment I less than one-third of II, II and III subequal in length, IV the shortest. THORAX: Collar narrow, flat; pronotum trapezoidal, lateral margins weakly marginate, anterior and posterior margins straight, anterior angles rounded, posterior angles broadly rounded, surface nearly flat, inclined, posterior lobe transversely rugose; calli distinct, from nearly flat to weakly elevated, with scattered irregular shiny spots; mesoscutum usually not exposed, covered by posterior margin of pronotum, except most lateral portions; scutellum triangular, nearly equilateral, apex weakly acute, disc mostly flat, weakly rounded along lateral margins; pleural area with a few short simple setae; metathoracic spiracle margin with conspicuous evaporatory area; metepisternum beset with dense macrotrichia, evaporatory area normal, dorsal margin inclined, nearly reaching dorsal portion of

metacoxa, peritreme ovoid and beset with short and dense microtrichia (fig. 4B); prosternum with a patch of dense, short, simple setae (fig. 4A). *Hemelytra:* Nearly parallel, sometimes weakly curved before costal fracture; clavus flat, elevated with respect to corium and deflexed along claval suture; corium deflexed laterally along medial fracture; cuneus nearly flat, sometimes weakly deflexed, barely longer than wide (ratio about 2.6) or much longer than wide (ratio at least 3); membrane about half as long as hemelytron. *Legs:* Coxae elongate, with sparse short simple setae, more densely set on anteroventral surface; trochanters ovoid, with dense short simple setae; femora nearly cylindrical, gently narrowing distally; pro- and mesofemur of subequal width and length, metafemur barely greater in diameter, about 1.4 times longer than pro- and mesofemur, femora covered with short sparse setae; tibiae nearly cylindrical, of subequal width, weakly expanded apically on pro- and mesotibia, longer than femur and trochanter combined, surface covered with short sparse setae and a few scattered spiniform setae; tarsus about 2.6 times shorter than femur, cylindrical, barely lesser in diameter than tibia, first tarsomere the shortest, second tarsomere weakly shorter than third, third the longest, first tarsomere ventrally covered with short dense setae; pretarsus as in figure 4C. ABDOMEN: Sternites with medium-sized dense simple setae. GENITALIA: Genital capsule subtriangular (fig. 6); aperture reclined, nearly ovoid, about half the length of genital capsule, weakly turned left, anterior margin not well sclerotized (fig. 6); ventrolateral right projection very small, blunt, almost nonexistent; proctiger reaching and surpassing caudal end of genital capsule (fig. 6); cuplike sclerite surpassing or barely reaching apex of genital capsule, right portion more elevated and projecting more caudad than left one, bases barely projecting cephalad beyond supragenital bridge; proctiger surpassing apex of genital capsule (fig. 4F); supragenital bridge weakly sclerotized but clearly visible under compound microscope, located above insertions of parameres; insertion of right paramere barely above left (figs. 4E, 6); left paramere sickle-shaped, apicoventral process acute (fig. 6); right paramere hatchet-shaped in medial view, body elongate, apically flattened, nearly truncated at the apex, with a small proximal blunt prolongation, medial caudal surface with numerous small tubercles, flat acute tubercle on dorsal angle directed medially, inner surface finely tuberculate (fig. 6); phallotheca nearly cylindrical, uniformly sclerotized, parallel-sided, basal lateral left side enlarged (figs. 6, 7), opening dorsal, longitudinal, of parallel margins, nearly reaching phallobase (fig. 7); vesica with a single spicule, deeply cleft forming two portions, basally expanded (figs. 7, 10, 13); left portion usually flattened dorsoventrally, rounded and denticulate at the apex, sometimes compressed laterally and less denticulate, distally with two prolongations (rami), apical and preapical, projecting dorsocephalad (figs. 7, 10, 13); rami usually weakly sinuate and directed to the right, long or short (figs. 7, 10, 13), apex weakly expanded, heavily denticulate; right portion about half as long as left one, inserted approximately at basal third of spicule, narrowing toward apex, strongly curved upward, vary rarely sinuate, apex denticulate or not, sometimes weakly expanded, in dorsal view strongly turned medially or weakly laterally, sclerotized part of ductus seminis long, located at base of spicule, about as long as right portion of spicule (figs. 7, 10, 13).

Female: Similar to male but usually larger, more ovoid, total length 3.84–5.15. COLORATION: Similar to male (fig. 1). ABDOMEN: Sternite IX usually dark red, sometimes red or bright red (fig. 1A–C, arrows). SURFACE AND VESTITURE: As in male. STRUCTURE: Mostly similar to male. HEAD: Always oval in lateral view, anteocular region about half as long as head length; eyes barely smaller, never reaching dorsal margin of head. GENITALIA: Subgenital plate triangular, elongate, much longer than wide, very acute on apex, barely projecting beyond middle of sternite VIII (fig. 9); base of ovipositor located nearly at longitudinal midpoint of abdomen; interramal sclerites well sclerotized, with irregular margins, subrectangular (fig. 8); dorsal lobe of interramal sclerite as an inverted triangle in dorsal view, medial margin subapically enlarged, truncate area before round apex, with scat-

tered microtrichia, strongly denticulate apically; dorsal margin of posterior wall not covered with microtrichia; sigmoid process projecting cephalad, strongly emarginate in anterior view, weakly denticulate (fig. 8); medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized medial areas; sclerotized rings oblong, usually subrectangular, posterior margin usually produced as an acute process, lateral margin recurved, medial and lateral margins thick, weakly curved, usually produced anteriorly and turned medially, accessory sclerite usually enlarged, weakly rounded, and broadly denticulate, or small and acute at apex (fig. 8); internal surface of dorsal labiate plate between anterior lateral margins covered with strong microtrichia; ventral labiate plate on ventrocaudal margin not conspicuously produced; anterior wall simple and membranous, inner margin of first gonapophyses symmetrical (fig. 9).

DISTRIBUTION: Widely distributed from the 100th meridian to the west, and from Canada to Baja California in Mexico (fig. 14).

HOST ASSOCIATIONS: Although there is some information regarding host-plant associations, no large series of host-associated specimens is available to draw conclusions. In some instances it seems that there is at least some preference for *Lupinus* (Fabaceae) and *Salvia* (Lamiaceae), but usually what is found is a mix of several unrelated groups of plants. As in *Hadronema*, species of *Aoplonema* have been associated either with meloid beetles or with cantharidin traps (Pinto, 1978; Young, 1984a, 1984b).

DISCUSSION: Species of *Aoplonema* are rather variable in coloration (fig. 1) and male genitalia, in particular regarding the vesica structure (figs. 7, 10, 13). Despite this variation, head and hemelytral structure and minor differences in coloration patterns allow for species separation.

The following proposal of species delimitation is presented as the best hypothesis to be deduced from the available data. Future work, including molecular markers, may show that the variation exhibited for instance by *A. princeps* is indeed a complex of morphologically difficult-to-separate species.

Complex male genitalic structures, in particular the vesica, are helpful in delimiting species within Orthotylini (e.g., Schuh, 1974; Stonedahl and Schwartz, 1986; Wyniger and Burckhardt, 2003). The vesica in *Aoplonema*, however, may vary greatly even within populations, as exemplified by specimens collected in the same locality at the same time (e.g., fig. 7: AMNH_PBI 00102790, AMNH_PBI 00102791), and thus it is of little value in discriminating species based on absolute differences. Nonetheless, overall differences, such as length of rami, are useful to assess species limits. Variability usually is not clearly stated in species' descriptions and it is rarely documented in Orthotylini (but see Pagola-Carte, 2006: fig. 4; Pagola-Carte and Zabalegui, 2006: fig. 3). I have documented the vesical structure in *Aoplonema* because it is highly variable (see figs. 7, 10, 13).

The supragenital bridge in the genital capsule is usually broad and well sclerotized in *Hadronema* group taxa. Nevertheless, in *Aoplonema* it is narrow and not well sclerotized, making it difficult to observe under the dissection microscope, although it is clearly visible under the compound microscope.

The structure of the dorsal lobe of the interramal sclerite usually is constant among species (e.g., *Hadronema*; see also Slater, 1950), and it may help to distinguish species. Nevertheless, *Aoplonema* species show a certain degree of variability (see also Pagola-Carte, 2006; Pagola-Carte and Zabalegui, 2006), apparently related with vesica variability, which prevents using these structures as characters for distinguishing species.

Because of the variability of male and female genitalic structures, other characters were explored to assess species discrimination. Head and hemelytra structures are useful in this task. In one group of specimens, which includes the new species *A. nigrum* and *A. rubrum*, the males have the anteocular part of the head less than one-third of its length, large eyes surpassing the dorsal margin, and long hemelytra and cuneus. The remaining group, which includes *A. princeps* only, has a longer anteocular region and shorter hemelytra. The various color morphs of the latter have been described as *A. princeps*, *A. uhleri*, and *A. uniforme*.

Aoplonema princeps was described as having a whitish cuneus and reddish body (fig. 1A) (Uhler, 1894); *A. uhleri* was de-

scribed as "bright red", including the femora, pronotum, and pleura (fig. 1D) (Van Duzee, 1928); and *A. uniforme* was described as having a "uniformly black cuneus" and "orange yellow" femora (fig. 1F) (Knight, 1928). Based on the original color descriptions of *A. princeps*, *A. uhleri*, and *A. uniforme*, and the examination of type material, specimens were sorted into these three categories, plus an additional apparently distinct population from Colorado (fig. 1B), whose specimens are darker than the others and the females have a bright red ninth sternite (fig. 1B, arrow). Nevertheless, several difficult-to-place specimens due to intermediate coloration prevented unambiguous placement for many of them (see examples under *A. princeps* discussion), and therefore sorting was considered preliminary.

Because male genitalic structure and dorsal coloration patterns were shown to be variable within the three nominal species under consideration, PCA and CVA analyses were performed to further assess their limits using standard measurements (see table 1). These analyses were also taken into consideration because the Colorado specimens were larger than specimens from other areas, and thus it was possible that some size-related character may be helpful to distinguish among species.

For PCA and CVA analyses, males of typical coloration for each nominal species representing the geographic range were measured: *A. uhleri* (n = 15), *A. princeps* (n = 31), *A. uniforme* (n = 13), the Colorado population (n = 30), *A. nigrum* (n = 12), and *A. rubrum* (n = 12). PCA is particularly useful to summarize in a few vectors the variability observed (Pimentel, 1992), and it is helpful when populations need to be identified in mixed samples (Claridge and Gillham, 1992). PCA was carried out for clustering examination among *Aoplonema* species, excluding *A. nigrum* and *A. rubrum*, which are clearly longer and have a different head structure. The PCA was based on a variance-covariance matrix since all variables are morphometric measures and complete independence is not assumed. The goal of the CVA was to find the best possible separation among groups of *Aoplonema* by maximizing variation among groups and minimizing intraspecific variation (Pimentel, 1992). *Aoplonema nigrum* and *A. rubrum* were included in this analysis for comparison purposes. Data were analyzed using the computer software PAST ver. 1.61 (Hammer et al., 2001).

TABLE 2
PCA Values for *Aoplonema*, Exclusive of *A. nigrum* and *A. rubrum*
Coefficients for the first two components represent the relative contribution of the variables to each component.

Variable	PC1	PC2
Total length	0.854	0.017
Cuneus-clypeus length	0.419	0.032
Length of head	−0.001	−0.032
Length of pronotum	0.068	0.071
Length of scutellum	0.086	0.111
Length of cuneus	0.155	−0.163
Width of head	0.033	0.093
Width of pronotum	0.167	0.432
Width of scutellum	0.098	0.244
Interocular distance	0.021	0.121
Length of antennal segment II	0.143	−0.827

The first two axes (PC1 and PC2) of the PCA of *Aoplonema* measurements account for 91% of the variation (fig. 11). PC1 explains most of the variation (85%), which represents the overall length variation among individuals (table 2). PC2 contrasts mainly the width of pronotum and scutellum with antennae measurements. The rest of the components can be thought of as representing residual variance in underlying variables that might be related to age, environmental, host-plant, or geographical variation (Claridge and Gillham, 1992). Figure 11 shows the high degree of variation of the four groups without discontinuity in the two principal components. *Aoplonema princeps* is highly variable in both components, including most of the variation exhibited by *A. uniforme*, and about half that of *A. uhleri*. *Aoplonema uniforme* tends to be as narrow as *A. princeps*, whereas *A. uhleri* is apparently slightly wider, which is reflected in the analysis. The Colorado population is larger than both *A. princeps* and *A. uniforme*, but it is intermediate with *A. uhleri*. This nearly continuous variation suggests that there is not a satisfactory way of separating the selected groups.

Using CVA to discriminate among groups within the complex of *A. princeps*, *A. uhleri*, *A. uniforme*, and the Colorado population

(fig. 12) demonstrates that no adequate separation is achieved with the measurements used, and large overlapping areas occur among the groups. The Colorado population had less overlap with the other taxa, but no morphological characters were found to distinguish these specimens from other taxa in *Aoplonema*. Unambiguous separation was achieved among *A. nigrum*, *A. rubrum*, and the rest of the *Aoplonema* specimens, even when males of both *A. nigrum* and *A. rubrum* are similar in size (i.e., measurements). The latter is congruent with structure of the anteocular region, which was not measured for the analyses. As supported by the classification coefficient based on the extracted canonical variates, *A. princeps*, *A. uhleri*, *A. uniforme*, and the Colorado population are morphologically inseparable, at least based on the variables used in these analyses.

The high variability found among groups may be related with environmental effects along the geographic distribution. Host plants may influence different phenotypic traits on associated insects, including size (Agrawal, 2001; Carrol and Boyd, 1992; Kirk, 1991; Mopper, 1996; Peppe and Lomônaco, 2003). Nutritional quality of host plants is probably the most important factor to influence insect size (e.g., Amarillo-Suárez and Fox, 2006; Clissold et al., 2006). Because the host-plant range is quite diverse for these taxa (appendix 2), it is plausible that coloration and size differences are due to plant effects.

Because no diagnostic character, or combinations of characters, was found to unambiguously separate *A. uhleri*, *A. uniforme*, and *A. princeps*, I propose that they are synonyms. *Aoplonema princeps*, based on priority, is the senior name.

Key to the Species of *Aoplonema*

1. Eyes in males protruding laterally and dorsally (i.e., large eyes; eye width/interocular distance ratio of ≥ 0.6) (fig. 5, table 1); hemelytra long (fig. 1), cuneus nearly three times as long as wide in males 2
— Eyes in males not so strongly projecting (i.e., eyes smaller; eye width/interocular distance ratio of <0.55) (fig. 5, table 1); hemelytra not as long (fig. 1), cuneus no more than 2.6 times as long as wide in males. . . . . *A. princeps*

2. Males with hind femora black or dark red with irregular black spots (fig. 1); females with dark femora (fig. 1); right portion of vesica not directed medially (fig. 7) . . . . . *A. nigrum*, sp. nov.
— Males with hind femora red, without black spots (fig. 1); females with red femora (fig. 1); right portion of vesica directed medially (fig. 10) . . . . . *A. rubrum*, sp. nov.

Aoplonema nigrum, sp. nov.
Figures 1, 6–9

Hadronema uhleri: Van Duzee, 1928: 182 [in part].
Hadronema robusta: Uhler, 1894: 250 [in part].

DIAGNOSIS: Recognized by overall dark coloration on legs, in particular the metafemur (fig. 1); the large eyes reaching the dorsal margin of the head; the short anteocular region; the long hemelytra and cuneus (fig. 1); the relatively small genital capsule and aedeagus (fig. 6); the vesica with rami of left portion short, and the right lateral portion weakly directed outward (fig. 7).

Aoplonema nigrum is similar to *A. rubrum* in its possession of large eyes, long cuneus, and elongate hemelytra, but it is distinguished by the black coloration of the legs, in particular the dark metafemur, which is red in *A. rubrum*; the bright red pronotum, which is darker in *A. rubrum*; and by having the right portion of the vesica weakly directed outward, not medially as in *A. rubrum*. *Aoplonema nigrum* is distinguished from *A. princeps* by the smaller eyes, longer anteocular region, shorter hemelytra and cuneus, and more elevated calli of the latter species. Association with males is necessary to unambiguously identify female specimens because *A. nigrum* females may resemble *A. rubrum*, and some variation may occur.

DESCRIPTION: *Male:* Delicate, large, total length 4.81–5.57. COLORATION (fig. 1): HEAD: Black; mandibular and maxillary plates reddish black; buccula and gena reddish black; labrum dark brown; labium dark brown, segment I pale; antennae black. THORAX: Collar, pronotum, mesoscutum, and scutellum orange-red, calli suffused with black, faint longitudinal line between calli black; thoracic pleura orange-red; sometimes metepimeron reddish black, evaporatory area dark and peritreme red; prosternum dark orange, sometimes brownish medially; meso-

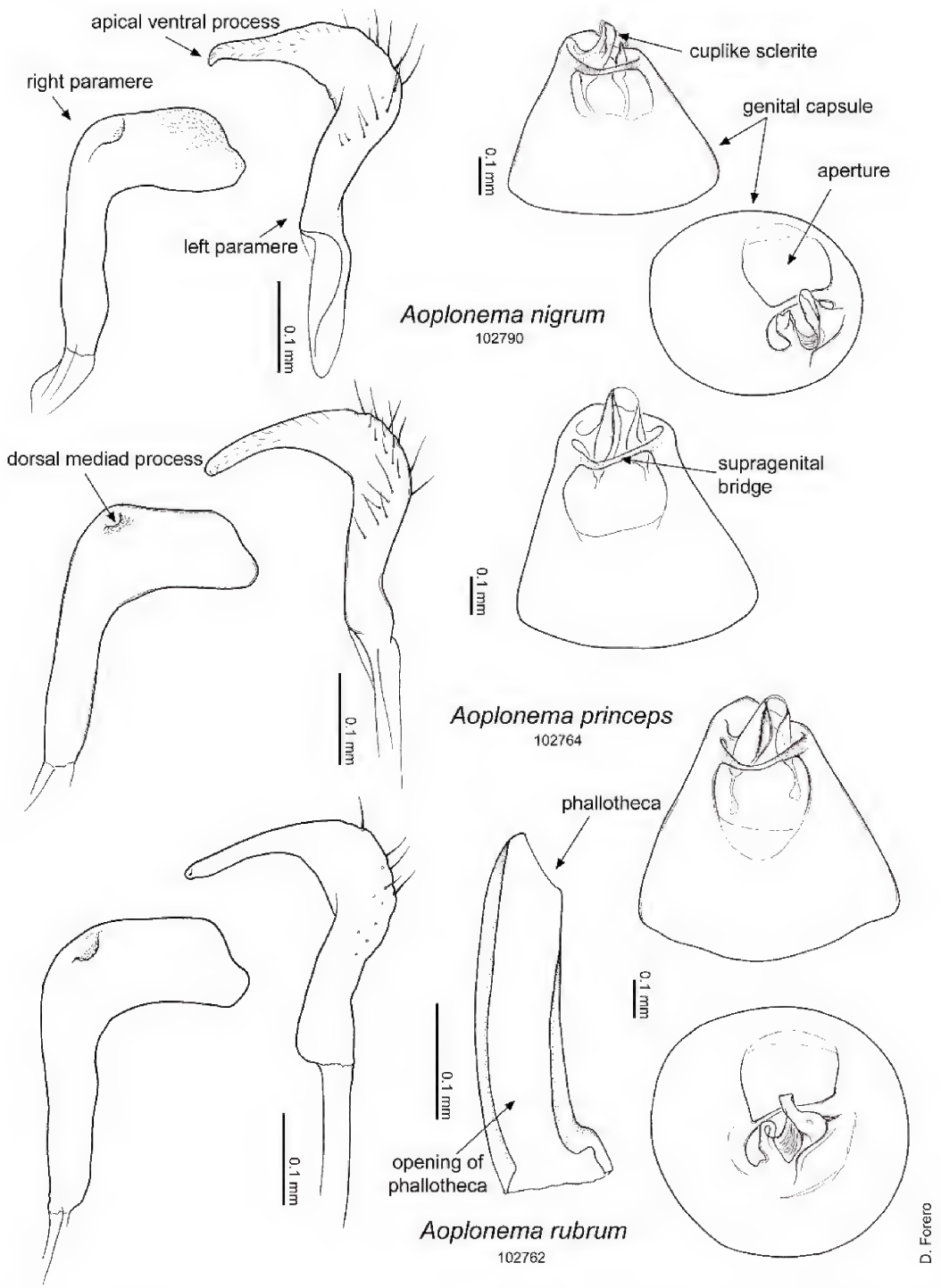


Fig. 6. *Aoplonema nigrum*, *A. princeps*, and *A. rubrum*. Male genitalia: right and left parameres, dorsomedial and dorsal views, respectively; genital capsule, dorsal and posterior views; phallotheca, dorsal view. Structural details as indicated.

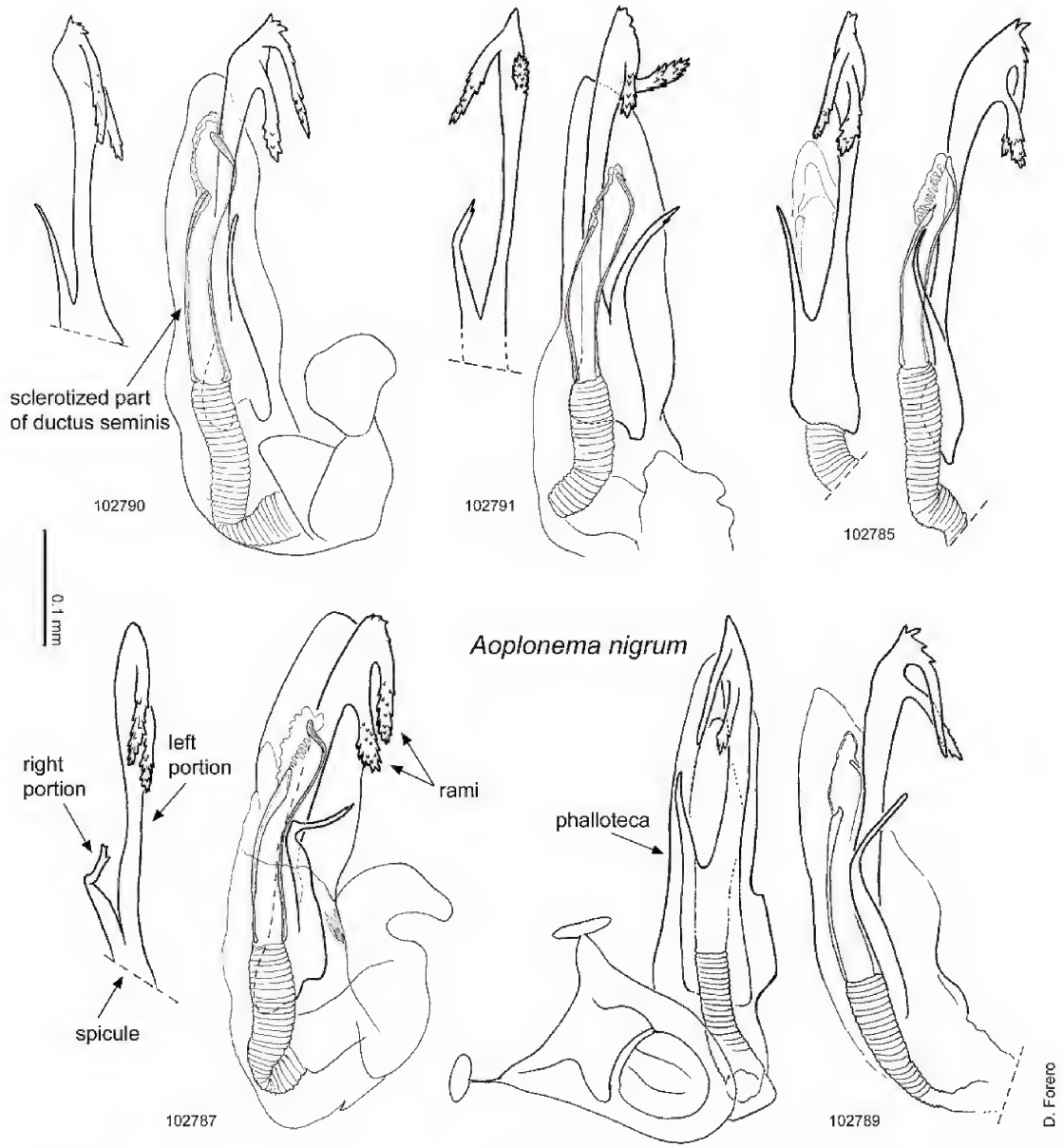


Fig. 7. *Aoplonema nigrum*. Male genitalia: phallus and vesica showing variation across geographic range, dorsal and lateral views. Structural details as indicated.

sternum partially black, sometimes orange-red; metasternum black. *Hemelytra:* Dark brown with pale costal margins; membrane and veins dark brown. *Legs:* Coxae orange-red, sometimes meso- and metacoxae darker; basal portion of trochanters orange-red, distal portion dark brown; femora, tibiae, and tarsi black or dark brown; profemur sometimes with apical two-thirds orange, femora with scattered black spots arranged irregularly. GENITALIA: Genital capsule black; proctiger brown; parameres dark brown. STRUCTURE: HEAD: Strongly declivent; anteocular region short, about a third of head length; frons weakly convex, nearly flat; gula about as long as buccula; eyes big, reaching dorsal margin of head in lateral view, interocular distance short (table 1).

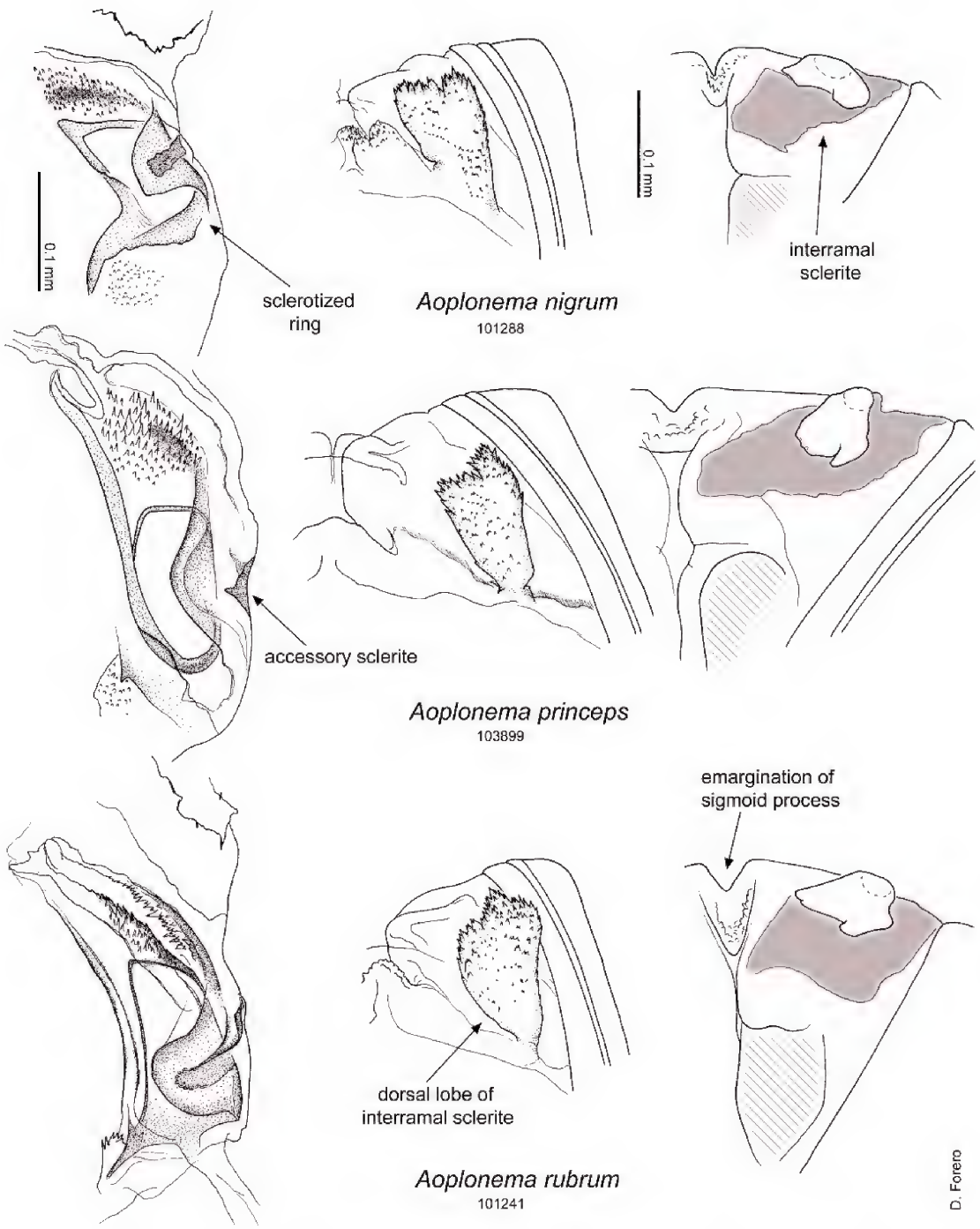


Fig. 8. *Aoplonema nigrum*, *A. princeps*, and *A. rubrum*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic.

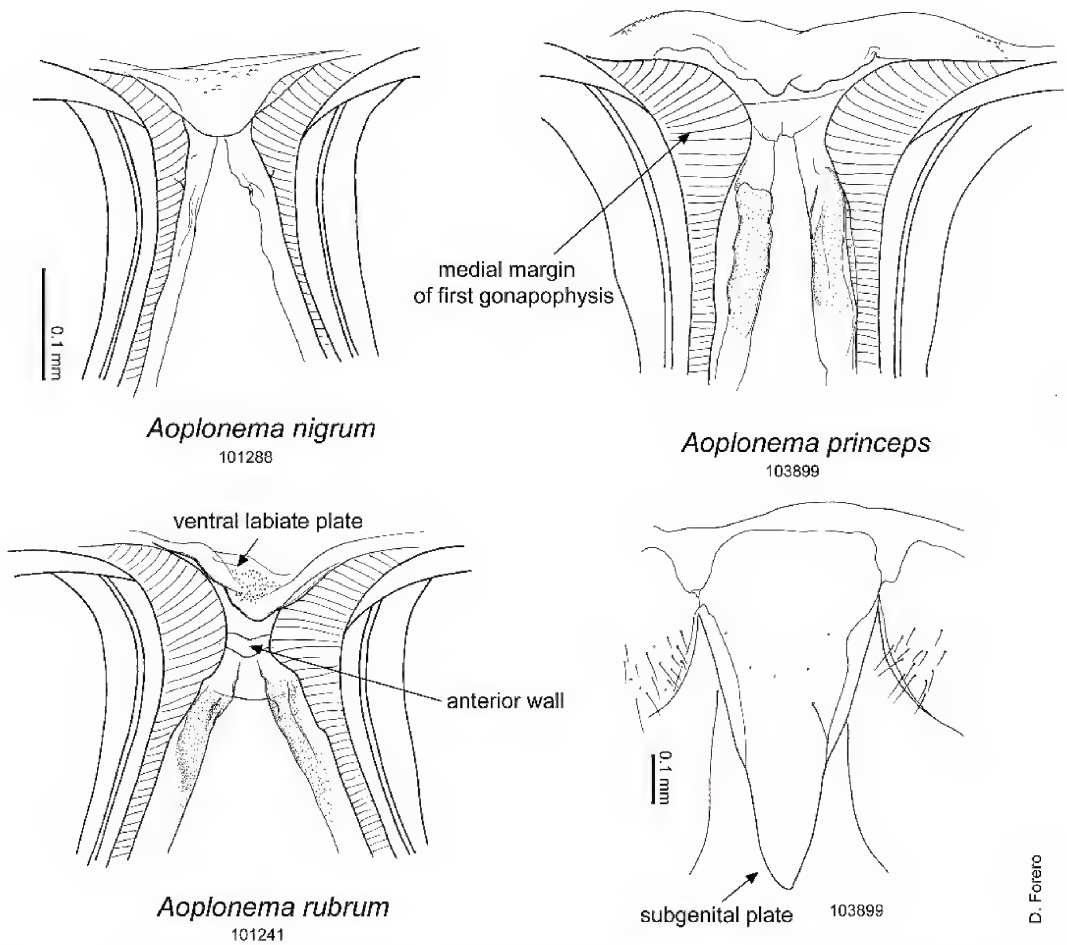


Fig. 9. *Aoplonema nigrum*, *A. princeps*, and *A. rubrum*. Female genitalia: anterior wall and bases of first gonapophysis, posterior view; subgenital plate, ventral view.

THORAX: Calli on pronotum nearly flat. *Hemelytra:* Nearly parallel; cuneus nearly flat, much longer than wide (fig. 1). GENITALIA: Genital capsule relatively small (fig. 6); parameres as in figure 6; left portion of vesica compressed laterally at apex, weakly denticulate, rami very short, not reaching apex of right portion (fig. 7); right portion from weakly sinuate to strongly curved upward, usually weakly directed to the right, bearing few small spines (fig. 7).

Female: Similar to male, shorter, ovoid, total length 4.61–5.11. COLORATION: Similar to male (fig. 1). ABDOMEN: Sternites black. STRUCTURE: GENITALIA: Interramal sclerites and dorsal lobe as in figure 8, sigmoid process denticulate; sclerotized rings oblong, posterior margin strongly produced medially, medial margin not produced cephalad, accessory sclerite enlarged, rounded and denticulate at apex (fig. 8); anterior wall and inner margins of first gonapophyses as in figure 9.

DISTRIBUTION: Restricted mostly to California (U.S.) and Baja California (Mexico), with a few records southeast of the Great Basin (fig. 14).

HOSTS: Mostly found on *Salvia dorri* and *S. mellifera*, as well as on unidentified species of *Salvia* (Lamiaceae). A few records are available for other species of *Salvia*, such as *S. columbariae* and *S. vaseyi*. Records are also available for the plant families Fabaceae, Asteraceae, Hydrophyllaceae, Polygonaceae, and Solanaceae, but in all cases the number of specimens associated with each plant species is small. Pinto (1978) mentioned

predation by *A. princeps* (as *A. uhleri*) on meloid beetles. From the figure provided, the host data, and the specimens examined, it is shown here that the species studied by Pinto is *A. nigrum* and not *A. princeps*.

ETYMOLOGY: The name is taken from the Latin "nigrum", meaning black, and refers to the dark coloration of the femora.

DISCUSSION: Teneral specimens may look more brownish or pale brown rather than black. Dissection is needed to separate these ambiguous specimens from *A. rubrum*.

Some specimens designated by Van Duzee (1928) as paratypes of *Hadronema uhleri* are here considered to belong to *A. nigrum*. One female that matches Uhler's (1894) label data for his description of *Hadronema robusta* is also here considered to belong to *A. nigrum*.

HOLOTYPE MALE: **USA: California: *Riverside Co.:*** Wilson Valley Road, 1 mi N of Hemet, [33.762°N 116.97111°W], 21 Apr 1980, L. Russell and M.D. Schwartz, *Salvia* sp. (Lamiaceae), Holotype *Aoplonema nigrum*, n. sp. D. Forero det. (red label), 1♂ (AMNH_PBI 00102665) (AMNH).

PARATYPES: **MEXICO: Baja California:** 3 mi NW of Villa Juarez, 32.64745°N 115.11988°W, 28 Apr 1963, H.B. Leech and P.H. Arnaud, Jr., 1♂ (AMNH_PBI 00107244) (USNM). El Crucero, 29.25°N 114.13°W, 612 m, 04 Apr 1976, J. Doyen, P. Rude, 4♂ (AMNH_PBI 00079856–AMNH_PBI 00079859), 1♀ (AMNH_PBI 00079860) (UCB). **USA: California: *Kern Co.:*** 9.6 mi W of Freeman Junction on Route 178, 35.67467°N 118.04412°W, 24 Apr 1980, L. Russell and M.D. Schwartz, *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00102700), 40♀ (AMNH_PBI 00102701–AMNH_PBI 00102740) (AMNH). ***Los Angeles Co.:*** Burbank, 34.18083°N 118.30806°W, 19 Apr 1931, C.H. Hicks, 1♂ (AMNH_PBI 00107205) (USNM); 23 May 1930, C.H. Hicks, 3♀ (AMNH_PBI 00107206–AMNH_PBI 00107208) (USNM). Los Angeles, 34.05222°N 118.24278°W, collector unknown, 1♂ (AMNH_PBI 00107242) (USNM). Los Angeles County, 34.05222°N 118.24278°W, collector unknown, 1♂ (AMNH_PBI 00107230) (USNM). ***Monterey Co.:*** 1 mi NE Bryson, 35.81693°N 121.07679°W, 17 Apr 1966, C.W. O'Brien, 1♂ (AMNH_PBI 00079876) (UCB). Bradley, 35.86333°N 120.79972°W, 23 Apr 1917, E.P. Van Duzee, *Artemisia* sp. (Asteraceae), 2♂, 2♀ (1♂, 1♀ on each pin) (AMNH_PBI 00077893, AMNH_PBI 00077894) (CAS). Wiley Ranch 6 mi W Greenfield, 36.32078°N 121.35078°W, 366 m, 08 May 1975–09 May 1975, J. Powell, 2♂ (AMNH_PBI 00079820, AMNH_PBI 00079862) (UCB). ***Orange Co.:*** Santa Ana, 33.74556°N 117.86694°W, 26 Mar 1935, E.L. Paddock, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00107243) (USNM). ***Riverside Co.:*** 1 mi S of Bundy Canyon, near Menifee Valley, 33.65321°N 117.28954°W, 10 May 1973, J.D. Pinto, 1♀ (AMNH_PBI 00083072) (UCR). 5.6 mi S of Sage on Route 3, site 2, T7S R1E S32, 33.51666°N 116.9°W, 19 Apr 1977, A.J. Mayor, *Eriogonum fasciculatum* (Polygonaceae), 1♂ (AMNH_PBI 00083130), 1♀ (AMNH_PBI 00083131) (UCR); 23 Mar 1977, collector unknown, 1♀ (AMNH_PBI 00083136) (UCR). Bautista Canyon, San Bernardino National Forest, T6E R2E S18, 33.6519°N 116.814°W, 870 m, 16 May 1995, Rob Garcia, 1♂ (AMNH_PBI 00083493), 2♀ (AMNH_PBI 00083494, AMNH_PBI 00083495) (UCR). Deep Canyon, Coyote Creek, 33.53714°N 116.53481°W, 05 Apr 1975, J.B. Tucker, 1♂ (AMNH_PBI 00083067) (UCR). Gavilan, 33.78444°N 117.36916°W, 14 Apr 1940, Timberlake, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00083153), 1♀ (AMNH_PBI 00083157) (UCR); 07 Apr 1940, Timberlake, *Solanum xanti* (Solanaceae), 2♀ (AMNH_PBI 00083155, AMNH_PBI 00083156) (UCR); 22 Apr 1952, Timberlake, *Salvia columbariae* (Lamiaceae), 1♀ (AMNH_PBI 00083158) (UCR). Menifee Valley, 33.72833°N 117.14556°W, 11 May 1975, John D. Pinto, 2♀ (AMNH_PBI 00083073, AMNH_PBI 00083074) (UCR); 12 Mar 1977, J.D. Pinto, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00102519) (AMNH), 1♀ (AMNH_PBI 00083137) (UCR); 26 Apr 1977, J.D. Pinto, collected at cantharidin bait, 2♀ (AMNH_PBI 00102522, AMNH_PBI 00102523) (AMNH), collected at cantharidin bait, 7♀ (AMNH_PBI 00083138–AMNH_PBI 00083144) (UCR). Menifee Valley, hills on W end, 33.72833°N 117.14556°W, 549 m, 30 Apr 1977, J.D. Pinto, 1♀ (AMNH_PBI 00083135) (UCR); 17 May 1978, J.D. Pinto, *Salvia mellifera* (Lamiaceae), 1♀ (AMNH_PBI 00083070) (UCR); 05 Apr 1978, J.D. Pinto, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00083544) (UCR); 13 May 1979, J.D. Pinto,

1♂ (AMNH_PBI 00083547) (UCR); 26 Apr 1977, J.D. Pinto, *Salvia mellifera* (Lamiaceae), 2♀ (AMNH_PBI 00083068, AMNH_PBI 00083069) (UCR); 14 May 1978, J.D. Pinto, *Salvia mellifera* (Lamiaceae), 1♀ (AMNH_PBI 00083071) (UCR); 14 Apr 1977, J.D. Pinto, collected at cantharidin bait, 3♀ (AMNH_PBI 00083132–AMNH_PBI 00083134) (UCR). Quail Valley, 33.70694°N 117.24417°W, 17 Feb 1977, J.D. Pinto, light trap, 1♂ (AMNH_PBI 00083152) (UCR). Riverside, 33.95333°N 117.39528°W, 25 Apr 1939, collector unknown, light trap, 1♂ (AMNH_PBI 00083129) (UCR). Temecula Canyon, Santa Margarita River, 33.41417°N 117.24389°W, 229 m, 18 Jun 1968, R. Hobza, 1♂ (AMNH_PBI 00083551) (UCR). Wilson Valley Road, 1 mi N of Hemet, 33.762°N 116.97111°W, 21 Apr 1980, L. Russell and M.D. Schwartz, *Salvia* sp. (Lamiaceae), 20♂ (AMNH_PBI 00101279–AMNH_PBI 00101284, AMNH_PBI 00102663, AMNH_PBI 00102664, AMNH_PBI 00102666–AMNH_PBI 00102674, AMNH_PBI 00102789–AMNH_PBI 00102791), 7♀ (AMNH_PBI 00101290, AMNH_PBI 00102675–AMNH_PBI 00102680) (AMNH); 21 Apr 1980, M.D. Schwartz, *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00102787) (AMNH). Ca 0.8 mi N of jct Deep Creek and Horsethief Creek, T7S R6E Sec 6, 33.57136°N 116.40671°W, 902 m, collector unknown, 1♂ (AMNH_PBI 00083066), 2♀ (AMNH_PBI 00083079, AMNH_PBI 00083080) (UCR); 16 May 1975, L.E. Clark, 1♂ (AMNH_PBI 00083128) (UCR). ***San Bernardino Co.:*** Cajon, 34.29889°N 117.45556°W, 1935, Oman, 2♂ (AMNH_PBI 00107240, AMNH_PBI 00107241), 8♀ (AMNH_PBI 00107245–AMNH_PBI 00107252) (USNM). Granite Pass, 34.81194°N 115.60972°W, 1237 m, 27 Apr 1968, S. Freeman, 1♂ (AMNH_PBI 00083548) (UCR); 27 Apr 1968, R. Hobza, 2♂ (AMNH_PBI 00083549, AMNH_PBI 00083550) (UCR); 27 Apr 1968, L.O. Tejada, 1♀ (AMNH_PBI 00083075) (UCR). March's Ranch Road 2 mi NE Baldwin Lake, 34.14983°N 117.45379°W, 25 May 1968, S. Freeman, 2♀ (AMNH_PBI 00083076, AMNH_PBI 00083077) (UCR); 25 May 1968, J. DeVol, *Salvia dorrii* (Lamiaceae), 1♂ (AMNH_PBI 00083065) (UCR); 25 May 1968, P.A. Rauch, *Salvia* sp. (Lamiaceae), 1♀ (AMNH_PBI 00083078) (UCR). Oro Grande Wash, 11 mi S of Adelanto, 34.42133°N 117.40391°W, 26 May 1941, Timberlake, *Salvia dorrii* (Lamiaceae), 1♂ (AMNH_PBI 00083154) (UCR). Phelan, Rt 138 at Phelan Road, 34.42531°N 117.6174°W, 1310 m, 16 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Salvia dorrii* (Kell.) Abrams (Lamiaceae), det. A. Sanders UCR140679, 2♂ (AMNH_PBI 00102395, AMNH_PBI 00102396), 11♀ (AMNH_PBI 00102397–AMNH_PBI 00102407) (AMNH). Jct of Black Canyon and Cedar Canyon Roads, 35.04°N 115.38611°W, 914 m, 18 May 1982, M.D. Schwartz, *Salvia dorrii* (Kell.) Abrams (Lamiaceae), 11♂ (AMNH_PBI 00101269–AMNH_PBI 00101278, AMNH_PBI 00102785), 4♀ (AMNH_PBI 00101286–AMNH_PBI 00101289) (AMNH). ***San Diego Co.:*** San Diego, 32.71528°N 117.15639°W, 19 May 1913, W.S. Wright, 1♂ (AMNH_PBI 00077895) (CAS). Tecate, 32.57728°N 116.62751°W, 20 May 1964, R. Duke, 1♂ (AMNH_PBI 00107254) (USNM). ***San Luis Obispo Co.:*** Arroyo Grande Creek SW of San Luis Obispo, 35.11644°N 120.58609°W, 160 m, 08 May 1985,R.T. Schuh and B.M. Massie, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00102645), 3♀ (AMNH_PBI 00101291–AMNH_PBI 00101293); *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00101285) (AMNH). SW of San Luis Obispo, Arroyo Grande Creek, 35.11644°N 120.58609°W, 160 m, 08 May 1985, R.T. Schuh and B.M. Massie, *Lupinus ludovicianus* Greene (Fabaceae), 1♂ (AMNH_PBI 00102656), 4♀ (AMNH_PBI 00102659–AMNH_PBI 00102662); *Salvia mellifera* (Lamiaceae), 6♂ (AMNH_PBI 00102649–AMNH_PBI 00102654), 2♀ (AMNH_PBI 00102657, AMNH_PBI 00102658); *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00102655) (AMNH). Tasajara Creek, 7 mi N of San Luis Obispo, 35.38432°N 120.65861°W, 04 Jun 1971–05 Jun 1971, J.D. Pinto, light trap, 1♂ (AMNH_PBI 00083543) (UCR). ***Santa Barbara Co.:*** 1 mi N of Refugio Beach, 34.47729°N 120.06917°W, 21 Jun 1965, R.W. Gear, 1♂ (AMNH_PBI 00079881) (UCB). Upper Oso Campground off Rt 154, 34.55583°N 119.75389°W, 305 m, 07 May 1985, R.T. Schuh and B.M. Massie, *Artemisia californica* (Asteraceae), 1♀ (AMNH_PBI 00102699), *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00102690), 8♀ (AMNH_PBI 00102691–AMNH_PBI 00102698) (AMNH).

OTHER SPECIMENS EXAMINED: **MEXICO: Baja California:** 12 mi E of El Rosario, 30.1532°N 115.53903°W, 329 m, 25 Mar 1979, J.D. Pinto, 2♀ (AMNH_PBI 00083150, AMNH_PBI 00083151) (UCR). 13 mi N of Punta Prieta, 29°N 114.4°W, 26 Mar 1979, J.D. Pinto, 3♀ (AMNH_PBI 00083145–AMNH_PBI 00083147) (UCR). 19 km E of El Rosario (km 47), 30.06691°N 115.65595°W, 143 m, 28 Mar 1980, J.D. Pinto and E. Fisher, 2♀ (AMNH_PBI 00083148, AMNH_PBI 00083149) (UCR). 44.5 km E of Rt 1 toward Parque San Pedro Martir, 30.97935°N 115.73089°W, 720 m, 24 Apr 1985, R.T. Schuh and B.M. Massie, *Salvia* sp. (Lamiaceae), 2♀ (AMNH_PBI 00102520, AMNH_PBI 00102521) (AMNH). Tecate, 3.4 mi S of El Condor, 32.41751°N 116.16666°W, 1219 m, 15 May 1982, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 3♀ (AMNH_PBI 00102742–AMNH_PBI 00102744) (AMNH). **USA: Arizona:** ***Mohave Co.:*** Hualapai Mountains, SE of Kingman, T20N R15W, 35.18944°N 114.05222°W, 1585 m, 09 Jun 1983, R.T. Schuh, M.D. Schwartz, G.M. Stonedahl, *Eriodictyon angustifolium* Nutt. (Hydrophyllaceae), 1♀ (AMNH_PBI 00101294) (AMNH). **California:** ***Los Angeles Co.:*** Chaparral Campground, Bouquet Canyon, Saugus, 34.55806°N 118.40527°W, 21 Apr 1972, J. Cicero, 1♂ (AMNH_PBI 00243738) (FSCA). Soledad Canyon, 34.42252°N 118.54036°W, 04 Apr 1969, collector unknown, 1♀ (AMNH_PBI 00083534) (UCR). ***Monterey Co.:*** 1.5 mi SW of Arroyo Seco Guard Station, Horse Bridge, 36.31222°N 121.29682°W, 396 m, 06 May 1975, J.A. Powell, 3♀ (AMNH_PBI 00079877–AMNH_PBI 00079879) (UCB); 06 May 1975, R. Wharton, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00079883) (UCB). ***Orange Co.:*** Santiago Canyon, 33.70361°N 117.60194°W, 1533 m, 02 Apr 1936, E.L. Paddock, 1♀ (AMNH_PBI 00107253) (USNM); *Salvia mellifera* (Lamiaceae), 1♀ (AMNH_PBI 00106295) (TAMU). ***Nevada Co.:*** Crystal Springs, 39.25934°N 120.97605°W, 09 Jul 1871, H. Edwards, Cotype (by Uhler) *robusta*, Cotype 52837 U.S.N.M. (red label), 1♀ (AMNH_PBI 00107120) (USNM). ***San Bernardino Co.:*** 12.5 mi SE of Ivanpah, Ivanpah Road, 35.21277°N 115.15332°W, 25 May 1977, J.D. Pinto, 1♀ (AMNH_PBI 00083545) (UCR). Burns Canyon, T1N R4E S11, 34.1876°N 116.5349°W, 1300 m, 27 Apr 1993, Ali Al-Wahaibi, 2♀ (AMNH_PBI 00083519, AMNH_PBI 00083520) (UCR). E of Wrightwood on Rt 2, 2 km W of Rt 138, Los Angeles National Forest, 34.37824°N 117.6117°W, 1556 m, 18 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Salvia dorrii* (Kell.) Abrams (Lamiaceae), det. Field ID, 2♀ (AMNH_PBI 00102379, AMNH_PBI 00102380) (AMNH). Mountain Pass, Mescal Range, T16N R13E S14, 35.4743°N 115.5435°W, 1410 m, 04 May 1993, Ali Al-Wahaibi, 2♀ (AMNH_PBI 00083496, AMNH_PBI 00083521) (UCR). Pioneertown, 34.15667°N 116.4961°W, collector unknown, 1♀ (AMNH_PBI 00083546) (UCR). Sheephole Mountains, T2N R12E S22, 34.2459°N 115.7095°W, 10 Apr 1984, F. Corcel, 1♀ (AMNH_PBI 00083533) (UCR). ***San Diego Co.:*** Anza-Borrego Desert State Park, Palm Canyon Trail, 33.22111°N 116.33333°W, 183 m, 17 May 1982, M.D. Schwartz, *Salvia vaseyi* (Lamiaceae), 1♀ (AMNH_PBI 00102752) (AMNH). San Diego County, 32.71528°N 117.15639°W, 09 Apr 1913, E.P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 2♀ (on same pin) (AMNH_PBI 00077899) (CAS), 29 Apr 1913, E. P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 2♀ (AMNH_PBI 00077906) (CAS), 04 May 1913, E. P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 1♀ (AMNH_PBI 00077904) (CAS), 06 May 1913, E. P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 2♀ (on same pin) (AMNH_PBI 00077901) (CAS), 08 May 1913, E.P. Van Duzee, paratype of "*uhleri*" E.P. Van Duzee, 2♂ (on same pin) (AMNH_PBI 00077858) (CAS), 12 May 1913, E.P. Van Duzee, paratype of "*uhleri*" E.P. Van Duzee, 1♂, 1♀ (on same pin) (AMNH_PBI 00077857) (CAS), 13 May 1913, E.P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 1♀ (AMNH_PBI 00077903) (CAS), 30 May 1913, E. P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 1♀ (AMNH_PBI 00077905) (CAS), 11 Apr 1914, E.P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 1♀ (AMNH_PBI 00077900) (CAS), 12 Apr 1914, E.P. Van Duzee, Paratype of "*uhleri*" E.P. Van Duzee, 1♀ (AMNH_PBI 00077902) (CAS). ***Solano Co.:*** Mix Canyon, Vaca Mountains, 38.40957°N 122.06698°W, 610 m,

26 Jun 1977, R.S. Miller, 1♀ (AMNH_PBI 00106294) (TAMU). ***Stanislaus Co.:*** Del Puerto Canyon, Frank Raines Park, 37.48833°N 121.20583°W, 341 m, 12 Apr 1980, K. Standow, 1♀ (AMNH_PBI 00079886) (UCB).

Aoplonema princeps (Uhler)
Figures 1A–F, 4–6, 8–12, 14

Hadronema princeps Uhler, 1894: 251 [n. sp.]; Knight, 1925: 182 [list]; Kelton, 1959: 30 [male genitalia]; Kelton, 1980: 225 [diagnosis, hosts, distribution].

Hadronema (*Aoplonema*) *princeps:* Knight, 1928: 177 [subgeneric placement]; Carvalho, 1958: 68 [catalog]; Henry and Wheeler, 1988: 410 [catalog].

Hadronema uhleri Van Duzee, 1928: 182 [n. sp.]. NEW SYNONYMY.

Hadronema (*Aoplonema*) *uhleri:* Knight, 1928: 181 [key, distribution]; Knight, 1968: 94 [distribution]; Henry and Wheeler, 1988: 410 [catalog].

Hadronema (*Aoplonema*) *uniformis* Knight, 1928: 180 [n. sp.]; Knight, 1968: 95 [diagnosis, distribution]. NEW SYNONYMY.

Hadronema uniforme: Steyskal, 1973: 207 [emendation].

Hadronema (*Aoplonema*) *uniforme:* Henry and Wheeler, 1988: 410 [catalog].

Aoplonema princeps: Kerzhner and Schuh, 1995: 4 [new status]; Schuh, 1995: 81 [catalog]; Maw et al., 2000: 116 [list].

Aoplonema uhleri: Kerzhner and Schuh, 1995: 4 [new status]; Schuh, 1995: 81 [catalog], Maw et al., 2000: 116 [list].

Aoplonema uniformis: Kerzhner and Schuh, 1995: 4 [new status]; Schuh, 1995: 81 [catalog].

DIAGNOSIS: Recognized by the anteocular portion of the head about half as long as total head length (fig. 5); the small eyes that do not reach the dorsal margin of the head in lateral view (fig. 5); and the weakly elevated and well-defined calli on pronotum.

Aoplonema princeps resembles *A. rubrum* due to the similar structure of the vesica (fig. 10), but it is easily distinguished from *A. rubrum* by the structure of the head, small size of eyes (fig. 5), and comparatively larger interocular space (table 1). *Aoplonema princeps* is easily distinguished from *A. nigrum* by the structure of the male genitalia, in particular the larger size of the genital capsule, and longer rami of the vesica (fig. 10). Females of all species are difficult to identify, and only tentative placements can be done in association with males.

REDESCRIPTION: *Male:* From delicate to nearly robust species, total length 3.56–5.10. COLORATION (fig. 1): HEAD: Reddish black to completely black; sometimes mandibular and maxillary plates red, line at base of plates connecting antennal bases with eyes pigmented black; labrum and labium dark brown, sometimes segment I of labium weakly reddish; antennae dark brown. THORAX: Collar, pronotum, mesoscutum, and scutellum reddish black (fig. 1A), red (fig. 1D, E), orange (fig. 1F), sometimes anterior lobe of pronotum nearly black (e.g., fig. 1B, F), sometimes mesoscutum and scutellum dark red (fig. 1B); thoracic pleura red, orange, or nearly black; venter black. *Hemelytra* (fig. 1): Dark brown to black (fig. 1D, F); sometimes areas next to claval suture whitish (fig. 1A); cuneus reddish brown to red with anterior portion white (fig. 1A), or completely dark brown (fig. 1D), or weakly reddish black (fig. 1B, D). *Legs:* Coxae, trochanters, and femora red (fig. 1D, E), reddish black (fig. 1A, B), or orange (fig. 1F), sometimes anterior femora with distal half paler (fig. 1B), sometimes irregular dark spots on surface; tibiae and tarsi dark brown. ABDOMEN: Reddish black. GENITALIA: Genital capsule reddish black or black; proctiger pale red or brown; parameres brown. STRUCTURE: HEAD: Gently declivent; anteocular region long, about one-third of head length (figs. 4A, 5); frons rounded; gula usually shorter than buccula; eyes small, not reaching dorsal margin of head in lateral view, interocular distance large (fig. 5; table 1). THORAX: Calli on pronotum weakly elevated and strongly impressed. *Hemelytra:* Nearly parallel; cuneus from nearly flat to weakly deflexed, about as long as wide (fig. 1). GENITALIA: Genital capsule relatively large (fig. 6); parameres as in figure 6; left portion of vesica compressed dorsoventrally at apex, strongly denticulate, rami long, almost reaching apex of right portion (fig. 10); right portion strongly curved upward, sometimes weakly sinuate apically, directed to the right, variously denticulate, from a single acute apex to weakly expanded and denticulate (fig. 10).

Female: Similar to male, weakly larger, ovoid, total length 4.26–4.95. COLORA-

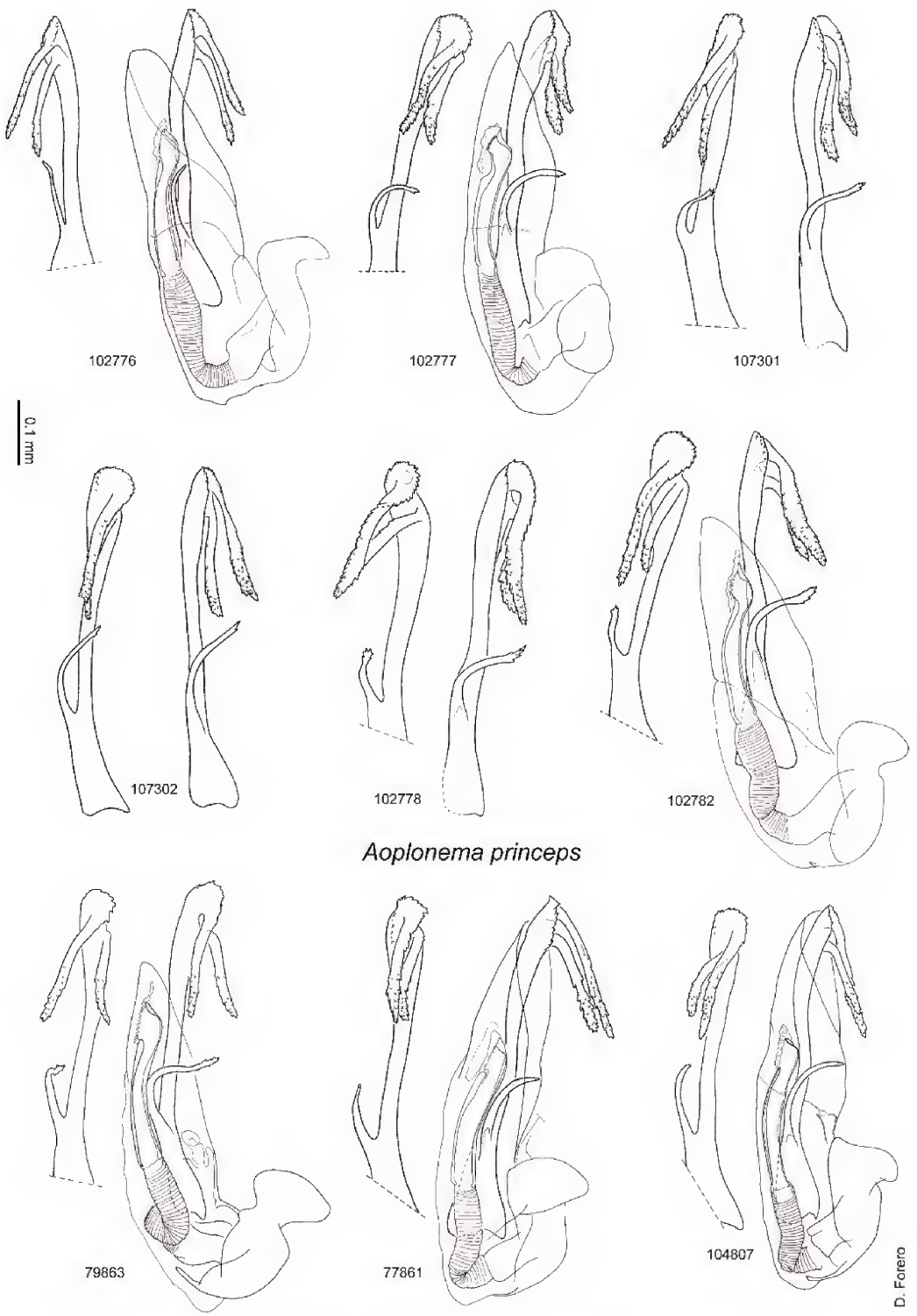


Fig. 10. *Aoplonema princeps*. Male genitalia: phallus and vesica showing variation across geographic range, dorsal and lateral views.

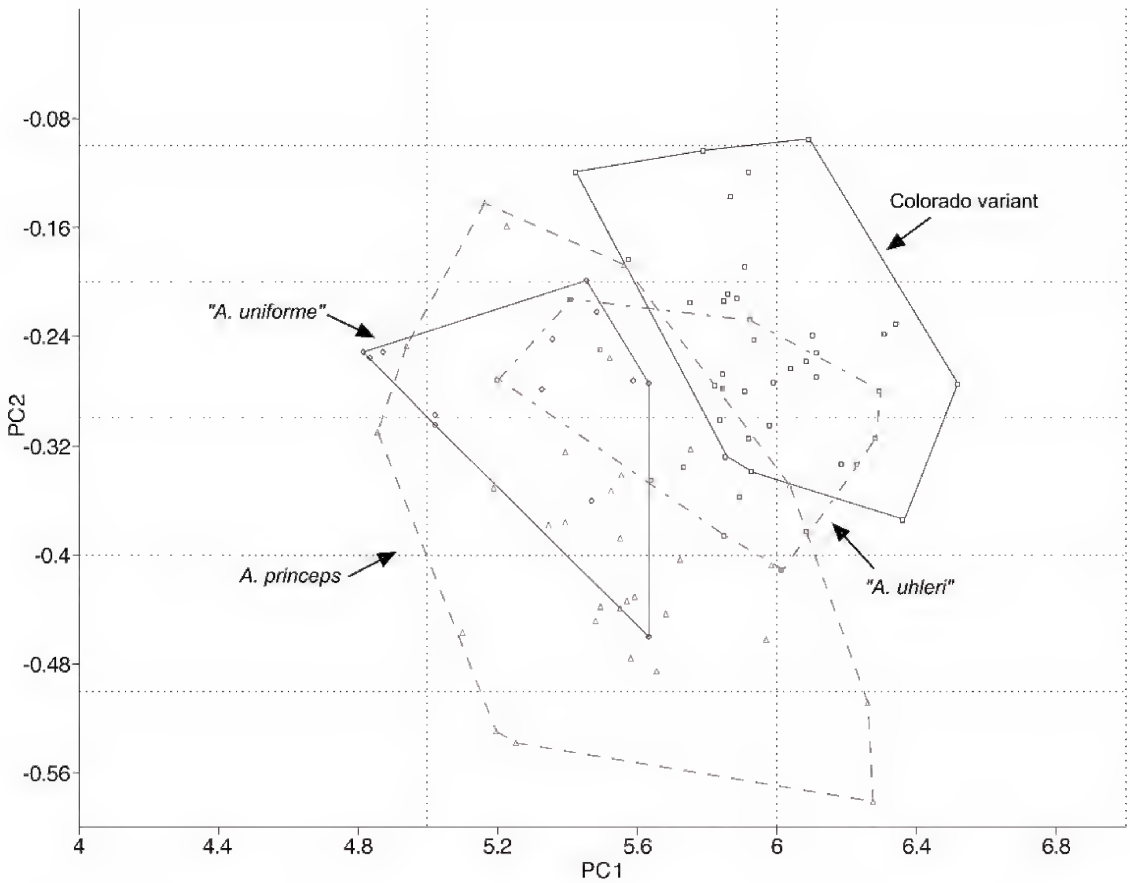


Fig. 11. Scatter plot of *Aoplonema* specimens, exclusive of *A. nigrum* and *A. rubrum*, along the first two components of the PCA.

TION: Similar to male (fig. 1). ABDOMEN: Sternites reddish black, sternite IX sometimes from bright red to reddish black. STRUCTURE: GENITALIA: Interramal sclerites and dorsal lobe of interramal sclerite as in figure 8, sigmoid process barely denticulate; sclerotized rings ovoid, elongate, posterior margin not produced, medial margin projecting cephalad, accessory sclerite not enlarged, rounded with a small denticulate at apex (fig. 8); anterior wall and inner margins of first gonapophyses as in figure 9.

DISTRIBUTION: Widely distributed from the 100th meridian to the west, and from southern Canada to Baja California (Mexico) (fig. 14).

HOSTS: *Aoplonema princeps* exhibits a large and diverse set of plant associations, among them with Asteraceae, Cupressaceae, Fabaceae, Fagaceae, Lamiaceae, Pinaceae, Rhamnaceae, Rosaceae, and Sarcobataceae species (see appendix 1). In addition to these plants, one specimen was found preying upon "*A. pomi*" (*Aphis pomi*?) (AMNH_PBI 00107173), which is not surprising because many phytophagous Miridae, including some Orthotylini, are known to feed on other insects (Wheeler, 2001). Young (1984b) mentioned that *A. princeps* (as *H. princeps*, *H. uhleri*, and *H. uniformis*) was associated with cantharidin traps. I have examined *Aoplonema* specimens associated with cantharidin traps, and I was able to confirm that they are *A. princeps*.

DISCUSSION: VARIABILITY: *Aoplonema princeps*, as delimited here, is a morphologically variable species (see generic discussion). *Aoplonema uhleri* and *A. uniforme* are considered synonyms of *A. princeps* because they cannot be distinguished by any combination

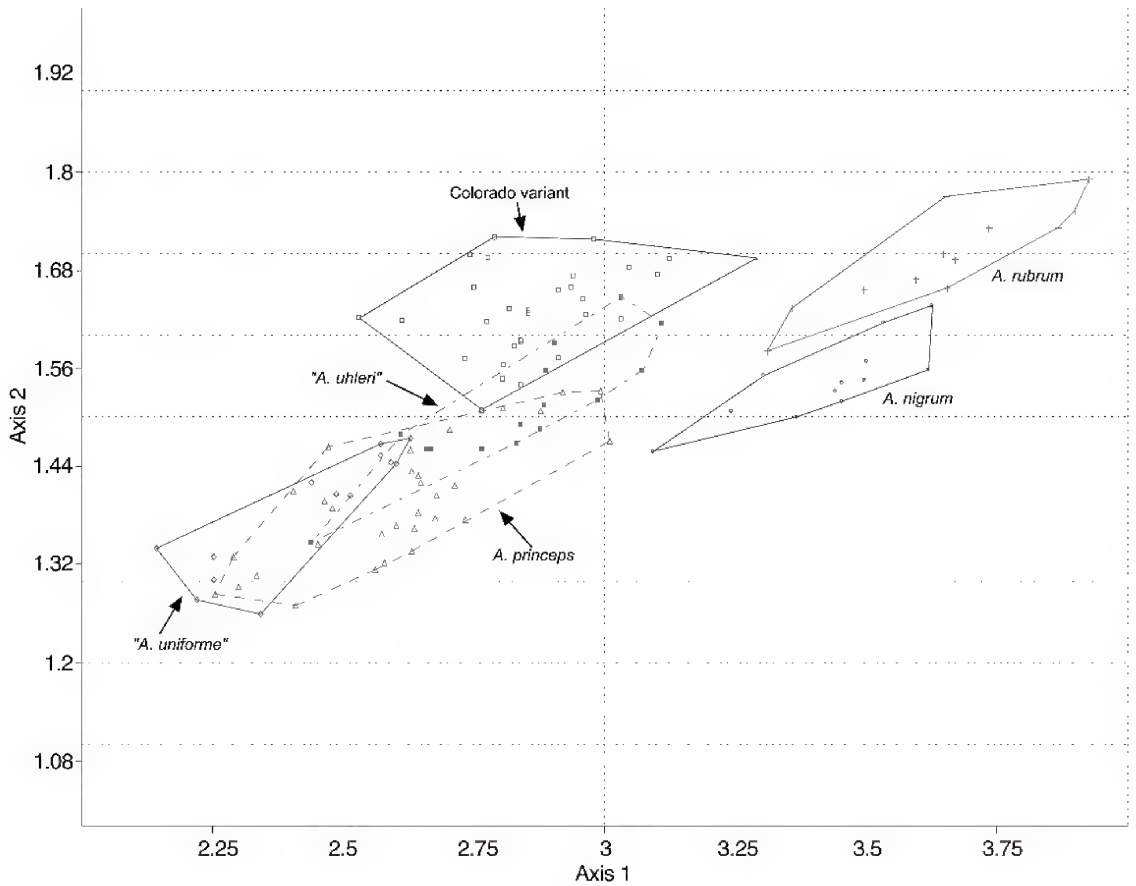


Fig. 12. Scatter plot of *Aoplonema* specimens along the first two canonical axes, producing maximal and second to maximal separation between all groups.

of characters. Several color variants are thus present in the broadly conceived *A. princeps* (fig. 1A–F).

Aoplonema princeps was described by Uhler (1894) as very similar to the reddish *H. robusta* Uhler (= *Lopidea robusta*), but narrower and having a distinct whitish cuneus (fig. 1A). Females of this variant usually have the sternite IX reddish black (fig. 1A, arrow). In addition to the whitish cuneus, some specimens of this color variant have the claval suture whitish (e.g., fig. 1A). Some specimens associated with *Sarcobatus* have a wide whitish claval suture, whereas specimens from other hosts have a small or no whitish fascia at all. Even specimens from the same collection event (i.e., same locality, same date), the width of this fascia varies (e.g., AMNH_PBI 00107077, AMNH_PBI 00107070). The white extent of the cuneus is also variable, not only among localities but within the same collection event, varying from a distinct transverse white band on the anterior margin of the cuneus to almost nonexistent, in which case the cuneus is nearly completely red (e.g., AMNH_PBI 00102501, AMNH_PBI 00102502).

Colorado specimens are usually darker on the legs and hemelytra with the cuneus slightly reddish (fig. 1B, arrow). Females of this variant usually have sternite IX bright red (fig. 1B, arrow). One examined female (AMNH_PBI 00107139) is as robust as other Colorado specimens, but it has sternite IX reddish black and a small whitish anterior marking on the cuneus, making it an intermediate between the white cuneus color variant and the darker Colorado variant.

Some females of the white cuneus color variant may exhibit a reddish sternite IX, looking similar to females from Colorado (e.g., fig. 1C, arrow). Some specimens from Colorado, although robust and with sternite IX bright red, have a small white band on the cuneus (e.g., AMNH_PBI 00107201–AMNH_PBI 00107203).

The slender body variant, with mostly orange femora, and dark brown cuneus without white markings (fig. 1F, arrow), is what Knight (1928) described as *A. uniforme*. This variant feed mostly on *Sarcobatus* (see appendix 1), but it may be associated with other plants as well. Intermediate forms between this variant and the more robust variant with red femora from Colorado exist. For instance, a robust female with dark orange legs (AMNH_PBI 00104806) is intermediate in color between these two. A male with red femora resembles the orange leg variant due to the narrow body (AMNH_PBI 00105586). Some specimens from Utah that have a clear white band on the cuneus are narrow, and the femora are orange, being intermediate between this orange leg color variant and the white cuneus one (AMNH_PBI 00102408–AMNH_PBI 00102412).

The variant with red femora, dark cuneus, and robust body is what Van Duzee (1928) described as *A. uhleri* (fig. 1D). The uniform dark cuneus is also present in the orange leg variant, although in the red femora variant the cuneus may also be reddish (fig. 1D, E, arrows) resembling the Colorado variant. A specimen from New Mexico (AMH_PBI 00105613) is similar to the coloration of *A. uhleri* paratypes, but it is darker on the hemelytra, middle, and posterior legs, and is barely more robust, being intermediate between the Colorado variant and those paratypes.

The distribution of these population color variants is indicated in figure 14. Because many specimens are intermediate between these populations, as exemplified above, I decided to arbitrarily assign whether a particular specimen belonged to either variant in those cases.

Vesica structure in *A. princeps* is quite variable and not correlated with coloration patterns or geographical distribution. For example, one *A. uhleri* paratype (AMNH_PBI 00077861) (figs. 1D, 10) and one *A. uniforme* paratype (AMNH_PBI 00104807) (figs. 1F, 10) share almost identical vesical morphology, although coloration patterns are quite different. Similarly, specimens from the Colorado population usually have the right portion of the vesica weakly expanded and nearly flattened (fig. 10, AMNH_PBI 00102778, AMNH_PBI 00102782), although specimens from Wyoming and California, with a distinctive whitish cuneus, have a similar vesica structure (fig. 10, AMNH_PBI 00079863, AMNH_PBI 00107301).

All aforementioned examples support the hypothesis of a single taxon that can be distinguished from other *Aoplonema* species, although being variable in coloration and size. The variability exhibited by *A. princeps* is similar to what is found in *Lopidea nigridea* Uhler, 1895, another Orthotylini occupying a similar geographic range in North America (Asquith, 1990).

SYNTYPE SERIES: Uhler (1894) in the original description of *A. princeps* stated that it was found in "northern California, Oregon and Washington State". Specimens from Uhler's collection in the USNM and AMNH are from various western localities: "Cal." (California), "W.T." (Western Territories), "Klikitat V., W.T." (Klickitat Valley, Western Territories), "Yakima City, W.T." (Western Territories), and "Yakima R., W.T." (Yakima River, Western Territories). All of those specimens fit the color description made by Uhler. Of those, there is one in the USNM labeled as "*Hadronema princeps*" with handwriting similar to that of Uhler and with a label "COTYPE (by Uhler) '*princeps*'" affixed by Knight. This specimen is almost complete, and it has been repinned on a point, probably also by Knight. Because this male is in good condition, and it fits Uhler's description and distributional data, it is designated as the lectotype for *A. princeps*.

LECTOTYPE MALE (here designated): **USA: Washington: *Yakima Co.:*** Yakima R.[iver], W.[estern] T.[erritories], [46.49984°N 120.4503°W], 04 Jul 1882–05 Jul 1882, Nelson's, P.R. Uhler collection, "*Hadronema princeps* Uhler W.T.", Cotype (by Uhler) "*princeps*", Lectotype *Hadronema princeps* D. Forero det. (red label), 1♂ (AMNH_PBI 00106738) (USNM).

HOLOTYPES OF SYNONYMS: **USA: California:** ***San Diego Co.:*** San Diego County, 32.71528°N 117.15639°W, 08 Jun 1913, E.P. Van Duzee, 1♂ (AMNH_PBI 00077855) (*Aoplonema uhleri*) (CAS). **Oregon:** ***Malheur Co.:*** Vale, 43.9821°N 117.2382°W, 684 m, 16 Jun 1926, R.W. Haegele, greasewood, 64, Holotype (by H.H. Knight) "*Hadronema uniformis*", H.H. Knight coll. 1976, 1♂ (AMNH_PBI 00070388) (*Aoplonema uniforme*) (USNM).

PARALECTOTYPES: **USA: California:** ***Unknown Co.:*** Unknown locality, 2♀ (AMNH_PBI 00107137, AMNH_PBI 00107138) (USNM). **Washington:** ***Klickitat Co.:*** Kli[c]kitat V.[alley], W.[estern] T.[erritories], 45.81706°N 121.1525°W, 146 m, 11 Jul 1882, unknown collector, 1♂ (AMNH_PBI 00102485) (AMNH). 2♂ (AMNH_PBI 00107122, AMNH_PBI 00107123) (USNM); 10 Jul 1882, Thorpe, 1♂ (AMNH_PBI 00102486), 1♀ (AMNH_PBI 00102489) (AMNH). 1♀ (AMNH_PBI 00107136) (USNM). ***Yakima Co.:*** Yakima City, W.T. [Western Territories], 46.55734°N 120.475°W, 02 Jul 1882–04 Jul 1882, unknown collector, 1♀ (AMNH_PBI 00107135) (USNM). Yakima R.[iver], W.[estern] T.[erritories], 46.49984°N 120.4503°W, 04 Jul 1882–05 Jul 1882, Nelson, 1♀ (AMNH_PBI 00102490) (AMNH).

PARATYPES (OF SYNONYMS): **USA: California:** ***San Diego Co.:*** San Diego County, 32.71528°N 117.15639°W, 23 May 1913, E.P. Van Duzee, Paratype of *A. uhleri*, 2♂, 2♀ (1♂, 1♀ on each pin) (AMNH_PBI 00077863, AMNH_PBI 00077864) (CAS); 24 May 1913, E.P. Van Duzee, Paratype of *A. uhleri*, 2♂ (AMNH_PBI 00077862, AMNH_PBI 00077865) (CAS); 19 Jun 1913, E.P. Van Duzee, Paratype of *A. uhleri*, 1♂ (AMNH_PBI 00077866) (CAS); 21 Jun 1914, E.P. Van Duzee, Paratype of *A. uhleri*, 1♂ (AMNH_PBI 00077861) (CAS). **Idaho:** ***Canyon Co.:*** Caldwell, 43.66294°N 116.68735°W, 15 Jun 1926, R.W. Haegele, Paratype of *A. uniforme*, 1♂ (AMNH_PBI 00104807) (CNC). **Oregon:** ***Malheur Co.:*** Vale, 43.9821°N 117.2382°W, 684 m, 16 Jun 1926, R.W. Haegele, Paratype of *A. uniforme*, *Sarcobatus* sp. (Sarcobataceae), 1♀ (AMNH_PBI 00106621) (USNM).

OTHER SPECIMENS EXAMINED: **CANADA: Alberta:** Blairmore, 49.6°N 114.43333°W, 14 Aug 1930, J.H. Pepper, 1♀ (AMNH_PBI 00104946) (CNC). Cypress Hills Provincial Park, Murray Hill Road, 49.63°N 110.2°W, 1433 m, 18 Jul 1990, M.D. Schwartz, 1♀ (AMNH_PBI 00104923) (CNC). Cypress Hills Provincial Park, Top Road, 9.6 km E of Rt 41 jct, 49.63°N 110.2°W, 1433 m, 15 Jul 1990, M.D. Schwartz, 1♂ (AMNH_PBI 00104921), 1♀ (AMNH_PBI 00104922) (CNC). Elkwater Park, Cypress Hills Provincial Park, 49.63°N 110.2°W, 13 Jul 1952, A.R. Brooks, 1♂ (AMNH_PBI 00104904) (CNC); 29 Jul 1952, L.A. Konotopetz, 1♀ (AMNH_PBI 00104908) (CNC); 16 Jul 1952, A.R. Brooks, 2♂ (AMNH_PBI 00104903, AMNH_PBI 00104905) (CNC); 18 Jul 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104907) (CNC). Kananaskis Hwy, 50.91555°N 115.14166°W, 25 Jul 1973, L.A. Kelton, 1♂ (AMNH_PBI 00104924), 1♀ (AMNH_PBI 00104943) (CNC). Lethbridge, 49.7°N 112.83333°W, 18 Jul 1930, J.H. Pepper, 1♀ (AMNH_PBI 00104945) (CNC); 15 Jul 1928, J. McDunnough, 1♀ (AMNH_PBI 00104944) (CNC). Lundbreck, 49.58°N 114.17°W, 07 Jul 1970, L.A. Kelton, 2♀ (AMNH_PBI 00104947, AMNH_PBI 00104948) (CNC). Manyberries, 49.4°N 110.7°W, 08 Jul 1952, L.A. Konotopetz, *Juniperus* sp. (Cupressaceae), 6♂ (AMNH_PBI 00104909–AMNH_PBI 00104914), 6♀ (AMNH_PBI 00104915–AMNH_PBI 00104920) (CNC). Medicine Hat, 50.03333°N 110.68333°W, 15 Jun 1930, J.H. Pepper, 1♀ (AMNH_PBI 00104949) (CNC). Waterton Lakes National Park, 49.05°N 113.9°W, 22 Jul 1923, J. McDunnough, 1♀ (AMNH_PBI 00104941) (CNC). Waterton Park, 49.05°N 113.91666°W, 26 Jul 1972, L.A. Kelton, *Pinus contorta* (Pinaceae), 4♂ (AMNH_PBI 00104930–AMNH_PBI 00104933) *Juniperus horizontalis* (Cupressaceae), 3♂ (AMNH_PBI 00104934–AMNH_PBI 00104936), 5♂ (AMNH_PBI 00104925–AMNH_PBI 00104929), 2♀ (AMNH_PBI 00104938, AMNH_PBI 00104939) (CNC); 14 Jul 1923, E.H. Strickland, 1♂ (AMNH_PBI 00104937) (CNC); 18 Jul 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104940) (CNC). **British Columbia:** ***Caribou Co.:*** Soda Creek, 52.33333°N 122.28333°W, 22 Jul 1947, G.J. Spencer, 2♂ (AMNH_PBI 00104830, AMNH_PBI 00104831) (CNC); 12 Jul 1950, G.J. Spencer, 2♂ (AMNH_PBI 00104825, AMNH_PBI 00104826), 6♀ (AMNH_PBI 00104833–AMNH_PBI 00104838) (CNC); 04 Jul 1950, G.J. Spencer, 1♂ (AMNH_PBI 00104827) (CNC); 27 Jul 1949, G.J. Spencer, 2♂ (AMNH_PBI 00104828,

AMNH_PBI 00104829) (CNC); 08 Jul 1949, G.J. Spencer, 1♂ (AMNH_PBI 00104832) (CNC). 10 mi S of Merritt, 49.97209°N 120.78333°W, 19 Jul 1959, L.A. Kelton, 1♀ (AMNH_PBI 00104898) (CNC). 10 mi W of Princeton, 49.45°N 120.72237°W, 31 Jul 1957, N.H. Anderson, 1♂ (AMNH_PBI 00104891) (CNC). Elko, 49.3°N 115.11666°W, 08 Jul 1970, L.A. Kelton, 1♀ (AMNH_PBI 00104899) (CNC). Midday Val[ley]., Merritt, 49.98333°N 120.93333°W, 736 m, Jul 1924, K.F. Auden, 4♀ (AMNH_PBI 00104894–AMNH_PBI 00104897) (CNC). Naramata, 49.59502°N 119.59556°W, 28 May 1958, H. & A. Howden, 1♀ (AMNH_PBI 00104892) (CNC); 16 Jul 1950, B.P. Beirne, 1♀ (AMNH_PBI 00104893) (CNC). Oliver, 49.18333°N 119.55°W, 19 Jul 1970, L.A. Kelton, 1♀ (AMNH_PBI 00104866) (CNC); 02 Jul 1974, L.A. Kelton, *Ceanothus* sp. (Rhamnaceae), 1♂ (AMNH_PBI 00104839), 3♀ (AMNH_PBI 00104840–AMNH_PBI 00104842) (CNC); 02 Jul 1975, L.A. Kelton, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00104843) (CNC); 29 Jun 1959, L.A. Kelton, 1♀ (AMNH_PBI 00104875) (CNC). Oliver, 7 mi E of Indian Reservation, 49.48904°N 119.42862°W, 08 Jul 1959, L.A. Kelton, *Salvia* sp. (Lamiaceae), 7♂ (AMNH_PBI 00104867–AMNH_PBI 00104873), 7♀ (AMNH_PBI 00104876–AMNH_PBI 00104882) (CNC). Oliver, McIntyre Creek, 49.18333°N 119.55°W, 04 Jul 1959, L.A. Kelton, 3♂ (AMNH_PBI 00104820–AMNH_PBI 00104822), 2♀ (AMNH_PBI 00104823, AMNH_PBI 00104824) (CNC). Oliver, McKinney Road, 49.18333°N 119.55°W, 08 Jul 1959, L.A. Kelton, 1♀ (AMNH_PBI 00104900) (CNC). Oliver, Sawmill Lake, 49.18333°N 119.55°W, 30 Jun 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 2♂ (AMNH_PBI 00104889, AMNH_PBI 00104890) (CNC). Oliver, Vaseaux Lake, 49.18333°N 119.55°W, 26 Jun 1959, L.A. Kelton, 1♂ (AMNH_PBI 00104888) (CNC); 10 Jul 1959, L.A. Kelton, *Sarcobatus* sp. (Sarcobataceae), 1♂ (AMNH_PBI 00104887) (CNC). Oliver, White Lake, 49.18333°N 119.55°W, 29 Jun 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00104852), 1♀ (AMNH_PBI 00104853) (CNC). Osoyoos, Anarchist Mountain, 49.03333°N 119.33333°W, 20 Jul 1959, L.A. Kelton, 1♀ (AMNH_PBI 00104883) (CNC); 13 Jul 1970, L.A. Kelton, 8♂ (AMNH_PBI 00104854–AMNH_PBI 00104861), 4♀ (AMNH_PBI 00104863–AMNH_PBI 00104865, AMNH_PBI 00104874) (CNC); 06 Jul 1959, R. Madge, 1♂ (AMNH_PBI 00104884) (CNC). Summerland, 49.56646°N 119.63951°W, 400 m, 06 Jul 1975, L.A. Kelton, 1♀ (AMNH_PBI 00104851) (CNC); 10 Jul 1975, L.A. Kelton, light trap, 1♂ (AMNH_PBI 00104862) (CNC); 12 Jul 1975, L.A. Kelton, 2♀ (AMNH_PBI 00104846, AMNH_PBI 00104847) (CNC), *Ceanothus* sp. (Rhamnaceae), 3♀ (AMNH_PBI 00104848–AMNH_PBI 00104850); 02 Jul 1974–11 Jul 1974, L.A. Kelton, *Ceanothus* sp. (Rhamnaceae), 2♂ (AMNH_PBI 00104844, AMNH_PBI 00104845) (CNC). Texas creek, Lillooet, 50.56666°N 121.8°W, 15 Jun 1926, J. McDunnough, *Chrysothamnus* sp. (Asteraceae), 11♂ (AMNH_PBI 00104808–AMNH_PBI 00104818), 1♀ (AMNH_PBI 00104819) (CNC). Vernon, 50.26666°N 119.26666°W, 02 Jul 1920, M.H. Ruhmann, 1♀ (AMNH_PBI 00107184) (USNM); 21 Jul 1923, D.G. Gillespie, 1♀ (AMNH_PBI 00104901) (CNC). Williams Lake, 52.11666°N 122.15°W, 12 Jul 1938, J.K. Jacob, 1♂ (AMNH_PBI 00104885), 1♀ (AMNH_PBI 00104886) (CNC). **Saskatchewan:** Val Marie, 49.23333°N 107.73333°W, 08 Aug 1955, A.R. Brooks, 1♀ (AMNH_PBI 00104942) (CNC). **MEXICO: Baja California:** 38 km E Rt 1 to Parque San Pedro Martir, 30.96°N 115.82°W, 400 m, 24 Apr 1985, R.T. Schuh and B.M. Massie, 10♂ (AMNH_PBI 00102212, AMNH_PBI 00102215, AMNH_PBI 00102217–AMNH_PBI 00102224), 11♀ (AMNH_PBI 00102225–AMNH_PBI 00102228, AMNH_PBI 00102232–AMNH_PBI 00102238), *Viguiera laciniata* A. Gray (Asteraceae), 2♀ (AMNH_PBI 00102229, AMNH_PBI 00102230), *Lotus scoparius* (Nott.) Ottley (Fabaceae), 4♂ (AMNH_PBI 00102214, AMNH_PBI 00102216, AMNH_PBI 00102765, AMNH_PBI 00102784), 1♀ (AMNH_PBI 00102231), *Sphaeralcea emoryi* Torr. (Malvaceae), 2♂ (AMNH_PBI 00102213, AMNH_PBI 00102239), 7♀ (AMNH_PBI 00102240–AMNH_PBI 00102246) (AMNH). **USA: Arizona:** ***Apache Co.:*** Eagar, ApacheNational Forest, 34.11111°N 109.29083°W, 2286 m, 12 Jul 1968, L. A. Kelton, 1♂ (AMNH_PBI 00104957) (CNC). ***Coconino Co.:*** Williams, 35.24944°N 112.19028°W, H.S. Barber, 1♂ (AMNH_PBI 00107237), 1♀ (AMNH_PBI 00107239) (USNM); collector unknown, 1♂ (AMNH_PBI 00107238) (USNM). **California:** ***El Dorado Co.:*** Phillips, 38.81777°N 120.0775°W, 24 Aug 1968, W.F. Chamber-

lain, 1♀ (AMNH_PBI 00106289) (TAMU). ***Fresno Co.:*** San Benito, Big Panoche Creek, 36.74841°N 120.51356°W, 21 Apr 1967, J. Powell, 5♂ (AMNH_PBI 00079863–AMNH_PBI 00079867), 7♀ (AMNH_PBI 00079868–AMNH_PBI 00079874) (UCB). ***Inyo Co.:*** E side of California Rt 141, 39.00944°N 120.76972°W, 1524 m, 31 May 1981, J.T. Polhemus, 1♀ (AMNH_PBI 00065089) (JTP). ***Kern Co.:*** Near Walker Pass, 35.6625°N 118.02583°W, 1524 m, 30 May 1981, J.T. Polhemus, 2♀ (AMNH_PBI 00065087, AMNH_PBI 00065088) (JTP). ***Los Angeles Co.:*** Los Angeles County, 34.05222°N 118.24278°W, Coquillett Collection, 1♂ (AMNH_PBI 00106615) (USNM). ***Mariposa Co.:*** Yosemite National Park, 37.85°N 119.56667°W, 1201 m, 29 May 1931, collector unknown, 1♂ (AMNH_PBI 00107170) (USNM). ***Modoc Co.:*** Upper Alkali Lake, Warner Mountains, 41.25222°N 120.60389°W, 02 Aug 1922, C.L. Fox, 1♀ (AMNH_PBI 00106619) (USNM). ***Mono Co.:*** Mono Lake, N shore, 38.07365°N 118.99159°W, 09 Aug 1997, G.R. Ballmer, *Artemisia tridentata* (Asteraceae), 1♀ (AMNH_PBI 00083531) (UCR). ***Monterey Co.:*** Pleyto, 35.86028°N 120.9925°W, 21 May 1920, E.P. Van Duzee, 1♂ (AMNH_PBI 00077869) (CAS). ***Riverside Co.:*** 5.6 mi S of Sage on Route 3, site 2, T7S R1E S32, 33.51666°N 116.9°W, 04 Jun 1976, collector unknown, 1♂ (AMNH_PBI 00083125) (UCR). Pauba Valley, T8S R1W S19, 33.5015°N 117.0307°W, 366 m, 12 May 1987, R.D. Goeden and D.W. Ricker, *Encelia virginensis* (Asteraceae), 2♂ (AMNH_PBI 00083118, AMNH_PBI 00083119) (UCR). *Encelia virginensis* (Asteraceae), 2♂ (AMNH_PBI 00107228, AMNH_PBI 00107229) (USNM). Riverside, 33.95333°N 117.39528°W, 22 May 1933, Timberlake, *Astragalus purshii* (Fabaceae), 1♂ (AMNH_PBI 00083124) (UCR). Temecula Canyon, Santa Margarita River, 33.41417°N 117.24389°W, 229 m, 18 May 1968, L.O. Tejada, *Lotus* sp. (Fabaceae), 1♂ (AMNH_PBI 00083081) (UCR). ***San Bernardino Co.:*** Colton, 34.07389°N 117.31278°W, 26 May 1917–28 May 1917, E.P. Van Duzee, 3♂ (AMNH_PBI 00077870–AMNH_PBI 00077872) (CAS). Joshua Tree National Monument, Covington Flat, 34.0089°N 116.3125°W, 17 Jun 1977, K.W. Cooper, 2♂ (AMNH_PBI 00083126, AMNH_PBI 00083127) (UCR). ***San Diego Co.:*** Guatay, 32.84893°N 116.5572°W, 19 Jul 1941, L.H. Banker, 1♂ (AMNH_PBI 00075266) (KU). Mission Dam, 32.84199°N 117.04058°W, 04 Jun 1965, J. Powell, 1♂ (AMNH_PBI 00079882) (UCB). Pine Hills, 33.01616°N 116.63446°W, 1108 m, 22 Jun 1950, Timberlake, *Symphoricarpos albus* (Caprifoliaceae), 1♂ (AMNH_PBI 00083122) (UCR). ***Siskiyou Co.:*** 5 mi S of Merrill, Oregon, near Tule Lake, 41.96785°N 121.56512°W, 1237 m, 26 Jun 1979, M.D. Schwartz, *Sarcobatus vermiculatus* (Sarcobataceae), 8♂ (AMNH_PBI 00102251–AMNH_PBI 00102258), 22♀ (AMNH_PBI 00102263–AMNH_PBI 00102283, AMNH_PBI 00102755) (AMNH); 26 Jun 1979, G.M. Stonedahl, *Sarcobatus vermiculatus* (Sarcobataceae), 10♀ (AMNH_PBI 00102285–AMNH_PBI 00102294) (AMNH). McCloud, 41.25583°N 122.13833°W, 1090 m, 23 Jul 1918, E.P. Van Duzee, 1♂ (AMNH_PBI 00107171) (USNM). Siskiyou County, 41.58333°N 122.51667°W, collector unknown, 1♀ (AMNH_PBI 00107151) (USNM). East side of Lower Klamath Lake, 41.99145°N 121.71243°W, 1270 m, 26 Jun 1979, R.T. and Joe Schuh, *Sarcobatus vermiculatus* (Sarcobataceae), 2♂ (AMNH_PBI 00102259, AMNH_PBI 00102779), 7♀ (AMNH_PBI 00102260–AMNH_PBI 00102262, AMNH_PBI 00102590–AMNH_PBI 00102593) (AMNH). ***Tulare Co.:*** 15 mi N of Kernville, 35.96844°N 118.47937°W, 10 May 1997, W.F. Chamberlain, 1♂ (AMNH_PBI 00105586) (TAMU). 4.5 mi S of Three Rivers, 36.37363°N 118.90361°W, 29 Apr 1947, Timberlake, *Frangula californica* (Rhamnaceae), 1♂ (AMNH_PBI 00083120) (UCR). California Hot Springs, 35.88028°N 118.67278°W, Jun 1953, Timberlake, *Eriodictyon californicum* (Hydrophyllaceae), 1♂ (AMNH_PBI 00083121) (UCR). Sequoia National Park, Ash Mountain Research Center, site 2, 36.49194°N 118.83056°W, 08 May 1987–18 May 1987, S. Haultain-Tweed, in cantharidin trap, 2♂ (AMNH_PBI 00133862, AMNH_PBI 00133863), 2♀ (AMNH_PBI 00133864, AMNH_PBI 00133865) (USNM). ***Unknown Co.:*** Unknown locality, 08 May 1950, Timberlake, *Eriogonum fasciculatum* (Polygonaceae), 1♂ (AMNH_PBI 00083123) (UCR). **Colorado:** ***Arapahoe Co.:*** Cherry Creek State Park, 39.63118°N 104.85283°W, 07 Jun 1977, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00065142) (JTP). ***Boulder Co.:***

6 mi W of Boulder, 40.015°N 105.38325°W, 12 Aug 1973, J.C. Schaffner, 1♀ (AMNH_PBI 00106293) (TAMU). Boulder, 40.015°N 105.27°W, 1676 m, 21 Jul 1903, E.P. Van Duzee, 1♂ (AMNH_PBI 00077887) (CAS); 29 Jun 1932, C.H. Hicks, 4♀ (AMNH_PBI 00107214–AMNH_PBI 00107215, AMNH_PBI 00107217, AMNH_PBI 00107218) (USNM); 18 Jul 1932, C.H. Hicks, 1♀ (AMNH_PBI 00107201) (USNM); 17 Jun 1932, C.H. Hicks, 4♂ (AMNH_PBI 00107209–AMNH_PBI 00107212) (USNM); 16 Jun 1932, C.H. Hicks, 2♀ (AMNH_PBI 00107213, AMNH_PBI 00107216) (USNM). Nederland, Science Lodge, 39.96139°N 105.51028°W, 2743 m, 29 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104956) (CNC). Nederland, Science Lodge, 39.96139°N 105.51028°W, 2896 m, 06 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104950) (CNC). Valmont Butte, 40.03081°N 105.2116°W, 1615 m, 30 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104955) (CNC). ***Clear Creek Co.:*** Timberline, II, Mt. Evans, 39.58859°N 105.64333°W, 183 m, 21 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104951) (CNC). ***Dolores Co.:*** 29 mi SW of Norwood, 37.8341°N 108.66702°W, 07 Jul 1980, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065109) (JTP). ***Douglas Co.:*** Chatfield State Park, 39.53666°N 105.06888°W, 03 Jun 1992, J.T. Polhemus, 3♂ (AMNH_PBI 00065104–AMNH_PBI 00065106), 1♀ (AMNH_PBI 00065107) (JTP); 10 Jun 1977, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00065132) (JTP). Head of Highline Canal, 39.56168°N 104.99692°W, 02 Jul 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00065131) (JTP); 16 Jun 1978, J.T. Polhemus, 2♂ (AMNH_PBI 00065117, AMNH_PBI 00065141), 5♀ (AMNH_PBI 00065108, AMNH_PBI 00065134–AMNH_PBI 00065137) (JTP); 20 Jun 1978, J.T. Polhemus, 1♂ (AMNH_PBI 00065092), 1♀ (AMNH_PBI00065138) (JTP); 02 Jul 1979, J.T. Polhemus, 3♂ (AMNH_PBI 00065093–AMNH_PBI 00065095) (JTP); 03 Jul 1979, J.T. Polhemus, 2♂ (AMNH_PBI 00065101, AMNH_PBI 00065140), 1♀ (AMNH_PBI 00065096) (JTP). Perry Park, 39.25667°N 104.99194°W, 13 Jul 1977, D.A. and J.T. Polhemus, 3♂ (AMNH_PBI 00065110–AMNH_PBI 00065112), 2♀ (AMNH_PBI 00065113, AMNH_PBI 00065114) (JTP), 1♀ (AMNH_PBI 00107200) (USNM). Roxborough Park Road near Chatfield State Park, 39.47389°N 105.08472°W, 1707 m, 06 Jul 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00065143) (JTP). Waterton, 39.49361°N 105.08806°W, 10 Jun 1982, D.A. Polhemus, *Rhus trilobata* (Anacardiaceae), 1♂ (AMNH_PBI 00065128), 1♀ (AMNH_PBI 00065130) (JTP); 07 Jul 1983, D.A. Polhemus, 1♂ (AMNH_PBI 00065126) (JTP); 17 Jun 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065127) (JTP); 22 Jun 1981, J.T. Polhemus, 1♂ (AMNH_PBI 00065079) (JTP); 01 Jul 1986, D.A. Polhemus, 1♂ (AMNH_PBI 00065080), 1♀ (AMNH_PBI 00065086) (JTP); 13 Jun 1986, D.A. Polhemus, 1♂ (AMNH_PBI 00065081) (JTP); 16 Jul 1981, J.T. Polhemus, 1♀ (AMNH_PBI 00065082) (JTP); 13 Jun 1985, D.A. Polhemus, *Ribes cereum* (Grossulariaceae), 1♂ (AMNH_PBI 00065119) (JTP); 24 Jun 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065129) (JTP). Waterton, Head of Hiline, 39.49361°N 105.08806°W, 18 Jul 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00065097) (JTP); 17 Jun 1980, J.T. Polhemus, 1♂ (AMNH_PBI 00065102) (JTP); 13 Jun 1980, J.T. Polhemus, 1♂ (AMNH_PBI 00065098) (JTP); 20 Jun 1980, J.T. Polhemus, 1♂ (AMNH_PBI 00065099), 1♀ (AMNH_PBI 00065100) (JTP). Near Waterton, Roxborough Road, 39.49361°N 105.08806°W, 1707 m, 11 Jun 1981, D.A. Polhemus, 1♀ (AMNH_PBI 00065085) (JTP). ***Eagle Co.:*** 3.9 mi S of Minturn, White River National Forest, 39.52986°N 106.43028°W, 2859 m, 19 Jul 1990, G. Zolnerowich, 1♂ (AMNH_PBI 00106291) (TAMU). Grouse Creek trail, N of Minturn, 39.59554°N 106.43336°W, 2390 m, 11 Aug 1986, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065116) (JTP). Vail, 39.64028°N 106.37361°W, 26 Jun 1977, J.T. Polhemus, 1♀ (AMNH_PBI 00065139) (JTP). Vail, 39.64°N 106.37416°W, 23 Jun 1986, J.T. Polhemus, 1♀ (AMNH_PBI 00065115) (JTP). ***Garfield Co.:*** Grizzly Creek N. (Colo. 2193), 39.7057°N 107.27825°W, 19 Jul 1896, C.F. Baker, *Artemisia tridentata* (Asteraceae), 1♀ (AMNH_PBI 00107147) (USNM). ***Gilpin Co.:*** Rollinsville, Roosevelt National Forest, 39.91722°N 105.50056°W, 02 Sep 1972, L.A. Kelton, 3♀ (AMNH_PBI 00104952–AMNH_PBI 00104954) (CNC). ***Jefferson Co.:*** Deer Creek Canyon, 39.85288°N 105.33944°W, 1981 m, 11 Jul 1986, R.T. Schuh and J.T. Polhemus, 18♂ (AMNH_PBI 00102547–AMNH_PBI 00102563, AMNH_PBI 00102782), 3♀ (AMNH_PBI

00102564–AMNH_PBI 00102566) (AMNH). Golden, 39.75556°N 105.22056°W, 1829 m, 25 Jul 1909, W.J. Gerhard, 1♂ (AMNH_PBI 00107193) (USNM); 24 Jul 1909, W.J. Gerhard, 1♀ (AMNH_PBI 00107199) (USNM). Indian Hills, 39.61667°N 105.23667°W, 2134 m, 11 Jul 1986, R.T. Schuh and J.T. Polhemus, *Astragalus* sp. (Fabaceae), 3♂ (AMNH_PBI 00101307–AMNH_PBI 00101309), 10♀ (AMNH_PBI 00101314–AMNH_PBI 00101322, AMNH_PBI 00102754) (AMNH). Lookout Mountain, 39.7324°N 105.238°W, 2134 m, 21 Jul 1916, A.C. Burrill, *Penstemon* sp. (Scrophulariaceae), 1♂ (AMNH_PBI 00107192) (USNM). North Turkey Creek Park near Tenders, 39.59468°N 105.22014°W, 1890 m, 16 Jul 1983, R.T. Schuh, D.A. and J.T. Polhemus, 3♂ (AMNH_PBI 00101306, AMNH_PBI 00102778, AMNH_PBI 00102783), 1♀ (AMNH_PBI 00101313) (AMNH). Red Rocks Park, 39.66972°N 105.20278°W, 07 Jul 1983, D.A. Polhemus, 2♂ (AMNH_PBI 00065120, AMNH_PBI 00065121) (JTP); 23 Jun 1982, D.A. Polhemus, 4♂ (AMNH_PBI 00065122–AMNH_PBI 00065125) (JTP); 21 Jun 1988, D.A. Polhemus, 1♀ (AMNH_PBI 00065083) (JTP); 29 Jun 1988, J.T. Polhemus, 1♀ (AMNH_PBI 00065084) (JTP). Red Rocks Park near Morrison, 39.65361°N 105.19056°W, 1707 m, 15 Jul 1983, R.T. Schuh and D.A. Polhemus, 11♂ (AMNH_PBI 00101295–AMNH_PBI 00101305), 3♀ (AMNH_PBI 00101310–AMNH_PBI 00101312) (AMNH). ***Larimer Co.:*** 40 mi W Fort Collins, Bennett Crk. Picnic Ground, Pingree Pk. Rd., 40.58°N 105.847°W, 2256 m, 14 Jul 1986, R.T. Schuh and J.T. Polhemus, 1♂ (AMNH_PBI 00102640) (AMNH). Forrester's (Colo. 2020, Colo. 1581), 40.93952°N 105.98546°W, 19 Jul 1895, C.F. Baker, 2♂ (AMNH_PBI 00125487, AMNH_PBI 00125488), 1♀ (AMNH_PBI 00125489) (CUIC). 1♂ (AMNH_PBI 00107194), 1♀ (AMNH_PBI 00107148) (USNM). Forrester's Ranch (Colo. 2013), 40.93952°N 105.98546°W, 03 Aug 1896, C.F. Baker, 1♀ (AMNH_PBI 00107139) (USNM). Fort Collins, 40.58528°N 105.08389°W, 13 Jun 1898, collector unknown, 1♂ (AMNH_PBI 00075272) (KU); 07 Jun 1899, collector unknown, 1♂ (AMNH_PBI 00075284) (KU); 09 Jul 1902, collector unknown, 1♂ (AMNH_PBI 00107195) (USNM); 17 Jul 1900, E.P. Van Duzee, 1♂ (AMNH_PBI 00077886), 1♀ (AMNH_PBI 00077888) (CAS). Prairie Divide, 40.85553°N 105.4922°W, 06 Aug 1965, collector unknown, 1♂ (AMNH_PBI 00106292) (TAMU). Rocky Mountain National Park, Moraine Valley, 40.33333°N 105.70833°W, 2438 m, 08 Jul 1966, J.A. Slater, 1♀ (AMNH_PBI 00102568) (AMNH). ***Las Animas Co.:*** 1 mi N of Stonewall on Purgatoire Campground Road, 37.16667°N 105.01667°W, 2560 m, 18 Aug 1986, R.T. Schuh, 1♀ (AMNH_PBI 00102567) (AMNH). ***Mineral Co.:*** Creede, 37.84917°N 106.92583°W, 04 Jul 1977, J.T. Polhemus, 1♂ (AMNH_PBI 00065133) (JTP). ***Montezuma Co.:*** Cortez, 37.34889°N 108.58528°W, 19 Jul 1968, L.A. Kelton, *Salicornia* sp. (Chenopodiaceae), 1♀ (AMNH_PBI 00105193) (CNC). Dolores, 37.47389°N 108.50389°W, 15 Aug 1925, H.H. Knight, 1♀ (AMNH_PBI 00107180) (USNM). ***Montrose Co.:*** 25 mi E of Nucla on Uncompahgre Plateau, 38.4255°N 108.4222°W, 2804 m, 14 Aug 1987, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00065078) (JTP). 27 mi E of Nucla, on Uncompahgre Plateau, 38.26944°N 108.05005°W, 14 Aug 1987, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065077) (JTP). ***Routt Co.:*** 8 mi S of Steamboat Springs (Colo. 2030), 40.36906°N 106.83111°W, 21 Jul 1896, Liebeck, 2♂ (AMNH_PBI 00107142, AMNH_PBI 00107143), 1♀ (AMNH_PBI 00107203) (USNM). Steamboat Springs, 40.485°N 106.83111°W, 2103 m, 01 Jul 1944, collector unknown, 1♀ (AMNH_PBI 00075261) (KU); 29 Jun 1931, E.D. Ball, 1♂ (AMNH_PBI 00107198) (USNM). ***Unknown Co.:*** Colo. 1685, collector unknown, 1♀ (AMNH_PBI 00125490) (CUIC). Colo. 1693, O. Heidemann, 1♂ (AMNH_PBI 00125491) (CUIC); collector unknown, 1♂ (AMNH_PBI 00077885) (CAS). Colo. 1732, O. Heidemann, 1♂ (AMNH_PBI 00125486) (CUIC). Colo. 2012, C.F. Baker, 1♂ (AMNH_PBI 00107191) (USNM). Colo. 2214, collectorunknown, 1♀ (AMNH_PBI 00077889) (CAS). Colo. 795, collector unknown, 1♂ (AMNH_PBI 00107197) (USNM). Dtch Geo, 11 Aug 1899, collector unknown, 1♀ (AMNH_PBI 00075273) (KU). **Idaho:** ***Adams Co.:*** Council, 44.72988°N 116.4381°W, 892 m, 25 Jun 1926, R.W. Haegele, 1♂ (AMNH_PBI 00107154) (USNM). Mesa, 44.62877°N 116.4507°W, 991 m, 13 Jul 1936, W.E. Schull, 1♂ (AMNH_PBI 00107155) (USNM). ***Bannock Co.:*** 3 mi E of McCammon, 42.65056°N 112.13325°W, 29 Jun 1966, W. Gagné and J. Haddock, 1♀

(AMNH_PBI 00079875) (UCB). ***Bear Lake Co.:*** Georgetown, 42.48214°N 111.3707°W, 06 Jul 1951, G.F. Knowlton, 1♀ (AMNH_PBI 00107150) (USNM). Paris, F 4741, 42.23333°N 111.41666°W, 1829 m, 08 Jul 1920, collector unknown, 1♂ (AMNH_PBI 00102462) (AMNH). ***Bonneville Co.:*** Grays Lake National Wildlife Refuge, road to lookout, 43.05144°N 111.38204°W, 30 Jul 1981, M.D. Schwartz, 2♂ (AMNH_PBI 00102491, AMNH_PBI 00102492), 2♀ (AMNH_PBI 00102493, AMNH_PBI 00102494) (AMNH). ***Butte Co.:*** Craters of the Moon National Monument, 43.41667°N 113.51667°W, 28 Jul 1965, D.S. Horning, 1♀ (AMNH_PBI 00107181) (USNM). ***Clearwater Co.:*** Weippe, 46.37601°N 115.9381°W, 919 m, 05 Jul 1935, W.E. Schull, 1♂ (AMNH_PBI 00107159), alfalfa, 1♂ (AMNH_PBI 00107158) (USNM). ***Franklin Co.:*** Dayton, 42.11306°N 111.99278°W, 1447 m, 29 Jul 1937, R.E. Miller, 1♀ (AMNH_PBI 00107186) (USNM). Williams Canyon, mp 20 on Rt 36, T12S R42 S30, 42.35694°N 111.69583°W, 2438 m, 19 Jul 1981, M.D. Schwartz, *Rudbeckia occidentalis* (Asteraceae), 1♂ (AMNH_PBI 00102514) (AMNH). ***Fremont Co.:*** 14 mi N of Ashton, 44.27444°N 111.4475°W, 22 Jul 1991, R.S. Peigler, 1♂ (AMNH_PBI 00105611), 1♀ (AMNH_PBI 00105612) (TAMU). Henrys Lake, 44.59722°N 111.3525°W, 2134 m, 12 Jul 1936, R.E. Miller, 1♂ (AMNH_PBI 00107156) (USNM). ***Gem Co.:*** Emmett, 43.87361°N 116.49833°W, 716 m, 23 Jun 1923, R.W. Haegele, *Sarcobatus* sp. (Sarcobataceae), 1♂ (AMNH_PBI 00106618) (USNM). ***Idaho Co.:*** Lolo Pass, at junction of Route 12 & FS Road 595 (to Granite Pass), Clearwater National Forest, 46.63514°N 114.57952°W, 30 Jul 1994, M.D. Schwartz, (Asteraceae), 1♀ (AMNH_PBI 00104902) (CNC). ***Latah Co.:*** Moscow, 46.7325°N 116.99917°W, 10 Jul 1932, T.A. Brindley, 1♂ (AMNH_PBI 00102479) (AMNH). 1♂ (AMNH_PBI 00107163), 1♀ (AMNH_PBI 00107189) (USNM); 05 Jun 1939–24 Jul 1939, T.A. Brindley, 3♂ (AMNH_PBI 00107144–AMNH_PBI 00107146) (USNM); 21 Jul 1936, W.E. Schull, 1♀ (AMNH_PBI 00107179) (USNM). ***Twin Falls Co.:*** Hansen, 42.52963°N 114.3061°W, 01 Aug 1931, Harold Watersw, 1♀ (AMNH_PBI 00107172) (USNM). ***Unknown Co.:*** Ross, 14 Jul 1929, R.A. Flock, 1♂ (AMNH_PBI 00083532) (UCR). **Montana:** ***Fergus Co.:*** Lewistown, 47.06247°N 109.4282°W, 1204 m, 07 Jul 1961, G.M. Chamberlain, 1♀ (AMNH_PBI 00106288) (TAMU). ***Gallatin Co.:*** Beaver Creek, 44.85687°N 111.37356°W, 1920 m, 15 Aug 1913, S.J. Hunter, 1♀ (AMNH_PBI 00105192) (CNC). Bridger Range, 45.88861°N 110.9575°W, 1676 m, 10 Aug 1925, collector unknown, 1♂ (AMNH_PBI 00107152) (USNM). East Flathead Mont, 45.96935°N 110.89503°W, 1737 m, 25 Jul 1902, collector unknown, 1♀ (AMNH_PBI 00107183) (USNM). Moose Flat Campground, 26 mi S of Bozeman Hot Springs on Rt 191, 45.35527°N 111.17055°W, 1737 m, 10 Aug 1986, Schuh, Schwartz, and Stonedahl, 2♂ (AMNH_PBI 00102512, AMNH_PBI 00102513), 2♀ (AMNH_PBI 00102516, AMNH_PBI 00102517) (AMNH). ***Glacier Co.:*** Browning, 48.55694°N 113.0125°W, 26 Aug 1951, L.A. Konotopetz, 1♂ (AMNH_PBI 00105189) (CNC). ***Missoula Co.:*** Missoula, 46.87222°N 113.99306°W, 31 Jul 1920, A.A. Nichol, 1♂ (AMNH_PBI 00106284) (TAMU). 1♂ (AMNH_PBI 00107098), 2♀ (AMNH_PBI 00107106, AMNH_PBI 00107107) (USNM). Missoula County, 46.908°N 113.957°W, 29 Jun 1934, collector unknown, 1♂ (AMNH_PBI 00106285) (TAMU). ***Park Co.:*** 30 mi NW of Big Timber, 18 mi W of Route 191, Big Timber Campground, Crazy Mountains, Gallatin National Forest, 46.1413°N 110.39556°W, 2134 m, 01 Aug 1994, M.D. Schwartz, 1♂ (AMNH_PBI 00105190) (CNC). ***Sanders Co.:*** Weeksville, 47.52299°N 114.994°W, 02 Aug 1882, collector unknown, 1♂ (AMNH_PBI 00102483), 2♀ (AMNH_PBI 00102487, AMNH_PBI 00102488) (AMNH). **Nevada:** ***Elko Co.:*** 16 mi SE of Elko on route 227, 40.72278°N 115.52125°W, 1707 m, 26 Jun 1983, R.T. Schuh and M.D. Schwartz, 1♀ (AMNH_PBI 00102528) (AMNH). Elko, 40.8325°N 115.76222°W, 12 Jul 1965, H.H. Knight, 1♂ (AMNH_PBI 00106616) (USNM). ***Esmeralda Co.:*** 12 mi W of Lida, 37.45813°N 117.71642°W, 08 Jul 1966, L. and C.W. O'Brien, 1♀ (AMNH_PBI 00104806) (CNC). 1♂ (AMNH_PBI 00105587) (TAMU). 1♂ (AMNH_PBI 00106617), 1♀ (AMNH_PBI 00106620) (USNM). 13 mi W of Lida on Rt 3, 37.45833°N 117.73397°W, 1938 m, 12 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Sarcobatus vermiculatus* (Hook.) Torr. (Sarcobataceae), det. J. Grimes 1980, 23♂ (AMNH_PBI 00102594–AMNH_PBI 00102615, AMNH_

PBI 00102792), 21♀ (AMNH_PBI 00102616–AMNH_PBI 00102636) (AMNH); 13 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Sarcobatus vermiculatus* (Hook.) Torr. (Sarcobataceae), det. J. Grimes 1980, 15♂ (AMNH_PBI 00102073–AMNH_PBI 00102087), 9♀ (AMNH_PBI 00102088–AMNH_PBI 00102095, AMNH_PBI 00102753) (AMNH); 12 Jul 1980, G.M. Stonedahl, *Artemisia* sp. (Asteraceae), 2♂ (AMNH_PBI 00102569, AMNH_PBI 00102570), 4♀ (AMNH_PBI 00102574–AMNH_PBI 00102577) (AMNH); *Sarcobatus vermiculatus* (Hook.) Torr. (Sarcobataceae), 18♂ (AMNH_PBI 00102161–AMNH_PBI 00102174, AMNH_PBI 00102775, AMNH_PBI 00102793), 20♀ (AMNH_PBI 00102176–AMNH_PBI 00102195), 1♂, 1♀ (in copula) (AMNH_PBI 00102175) (AMNH). ***Humboldt Co.:*** 18 mi N of Paradise Valley, Lye Creek Camp, 41.75443°N 117.53361°W, 2286 m, 07 Jul 1966, F., P., and B. Rindge, 2♀ (AMNH_PBI 00102518, AMNH_PBI 00102524) (AMNH). ***Lander Co.:*** 11 mi S of route 50 on route 376, T17N R44E, 39.25817°N 117.01958°W, 1768 m, 28 Jun 1983, R.T. Schuh and M.D. Schwartz, *Sarcobatus vermiculatus* (Sarcobataceae), 1♂ (AMNH_PBI 00102250) (AMNH). ***Lyon Co.:*** 8 mi N of Sweetwater summit on highway 22, Toiyabe National Forest, 38.63046°N 119.26097°W, 1811 m, 11 Jul 1980, G.M. Stonedahl, *Sarcobatus vermiculatus* (Sarcobataceae), 1♀ (AMNH_PBI 00102589) (AMNH). ***Nye Co.:*** 28 mi N of Belmont on Rt 82, 38.99273°N 116.70091°W, 2012 m, 13 Jul 1980, R.T. Schuh, *Sarcobatusvermiculatus* (Sarcobataceae), 1♂ (AMNH_PBI 00102249), 1♀ (AMNH_PBI 00102284) (AMNH); 13 Jul 1980, G.M. Stonedahl, *Sarcobatus vermiculatus* (Sarcobataceae), 1♂ (AMNH_PBI 00102573), 1♀ (AMNH_PBI 00102588) (AMNH). ***White Pine Co.:*** 17.5 mi N of Hwy 50 on Steptoe Creek road, 39.39531°N 114.8324°W, 2341 m, 19 Jul 1980, G.M. Stonedahl, 1♀ (AMNH_PBI 00102527) (AMNH). 31.8 mi N of Highway 50 on Steptoe Creek Road, 39.6806°N 114.75796°W, 1981 m, 19 Jul 1980, G.M. Stonedahl, *Sarcobatus vermiculatus* (Sarcobataceae), 3♂ (AMNH_PBI 00102571, AMNH_PBI 00102572, AMNH_PBI 00102774), 10♀ (AMNH_PBI 00102578–AMNH_PBI 00102587) (AMNH). **New Mexico:** ***San Juan Co.:*** 10 mi E of Blanco, 36.72403°N 107.64378°W, 14 Jun 1992, W.F. Chamberlain, 1♂ (AMNH_PBI 00105613) (TAMU). **North Dakota:** ***Billings Co.:*** 8 mi W of Belfield at Fryburg Oil Field, 46.84990N 103.40000W, 28 Jun 2000, T.J. Henry, *Artemisia tridentata* Nutt. (Asteraceae), 2♂ (AMNH_PBI 00165796, AMNH_PBI 00165797), 2♀ (AMNH_PBI 00165800, AMNH_PBI 00165801) (USNM). ***Slope Co.:*** 1 mi N of Marmarth, 46°18′N 103°93′W, 26 Jun 2000, T.J. Henry, *Artemisia tridentata* Nutt. (Asteraceae), 2♂ (AMNH_PBI 00165798, AMNH_PBI 00165799), *Symphoricarpos occidentalis* Hook. (Caprifoliceae), 4♂ (AMNH_PBI 00165792–AMNH_PBI 00165795), 1♀ (AMNH_PBI 00165802) (USNM). **Oregon:** ***Benton Co.:*** Corvallis, 44.56472°N 123.26083°W, 26 Jun 1926, C.J. Drake, 1♀ (AMNH_PBI 00107177) (USNM); 09 Jul 1947, H.H. Crowell, seed cabage, 2♂ (AMNH_PBI 00107165, AMNH_PBI 00107166) (USNM). ***Columbia Co.:*** Scappoose, 45.75444°N 122.87639°W, 16 Jul 1935, K. Gray, 1♂ (AMNH_PBI 00102481) (AMNH). ***Crook Co.:*** 3 mi S of Prineville, 44.25728°N 120.85429°W, 02 Aug 1935, J. Schuh, 2♂ (AMNH_PBI 00102247, AMNH_PBI 00102248) (AMNH). ***Harney Co.:*** Albert Lake, 43.44959°N 119.1377°W, 02 Jul 1935, J. Schuh, 1♂ (AMNH_PBI 00102482) (AMNH). ***Hood River Co.:*** Hood River, 45.71556°N 121.51°W, Jul 1931, R.H. Beamer, 3♂ (AMNH_PBI 00075258, AMNH_PBI 00075259, AMNH_PBI 00075279), 1♀ (AMNH_PBI 00075276) (KU). Mount Hood, 45.53806°N 121.56722°W, 03 Jul 1935, R.H. Beamer, 1♀ (AMNH_PBI 00075265) (KU). ***Jackson Co.:*** 0.5 mi S of Siskiyou Summit on Old Rt 99, Old Siskiyou Rd, 42.06777°N 122.60583°W, 1311 m, 27 Jun 1979, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102466) (AMNH). 0.5 mi S of Siskiyou Summit on Old Rt 99, Old Siskiyou Rd, 42.06777°N 122.60583°W, 1346 m, 26 Jun 1979, R.T. and Joe Schuh, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102457), 1♀ (AMNH_PBI 00102475) (AMNH). Shady Cove, 42.61068°N 122.8125°W, 427 m, 23 Jun 1977, J. Schuh, 1♂ (AMNH_PBI 00102463), 3♀ (AMNH_PBI 00102472–AMNH_PBI 00102474) (AMNH). Siskiyou Summit, Old Road, 42.075°N 122.60583°W, 1260 m, 22 Jul 1999, Schwartz, Gillespie, Quiring, *Lupinus* sp. (Fabaceae), 4♀ (AMNH_PBI 00103899–AMNH_PBI 00103902) (CNC); 28 Jul 1999,

M.D. Schwartz, *Chrysothamnus nauseosus* (Pall. ex Pursh) Britt. (Asteraceae), 1♂ (AMNH_PBI 00103896) (CNC). Siskiyou Summit, Old Siskiyou Hwy and Frontage Rd, 42.075°N 122.60583°W, 1314 m, 01 Jul 1994, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00105188), 1♀ (AMNH_PBI 00105191) (CNC). ust E of Pinehurst, 42.11778°N 122.365°W, 1340 m, 27 Jun 1979, R.T. and Joe Schuh, 2♂ (AMNH_PBI 00102459, AMNH_PBI 00102460), 2♀ (AMNH_PBI 00102477, AMNH_PBI 00102478) (AMNH). ***Josephine Co.:*** 12 mi N of Cave Junction, 42.33654°N 123.64694°W, 470 m, 10 Jul 1979, R.T. and Joe Schuh, 1♂ (AMNH_PBI 00102458), 1♀ (AMNH_PBI 00102476) (AMNH). ***Lake Co.:*** 11 mi N of Silver Lake, 43.25913°N 120.888°W, 1500 m, 25 Jun 1979, R.T. Schuh, 2♂ (AMNH_PBI 00102470, AMNH_PBI 00102471) (AMNH). ***Lane Co.:*** Blue River Reservoir, 44.15472°N 122.34°W, 31 Jul 1979, G.M. Stonedahl, *Chrysolepis chrysophylla* (Fagaceae), 1♂ (AMNH_PBI 00102467) (AMNH). ***Linn Co.:*** HJ Andrews Experimental Forest, 1 mile from Road 350 end, Ridge Site, 44.2325°N 122.1167°W, 16 Jul 1985, Stonedahl & McIver, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102495), 1♀ (AMNH_PBI 00102496) (AMNH). HJ Andrews Experimental forest, Carpenter Mountain, end of Natl Forest Rd 1506-350, 44.27834°N 122.14628°W, 1448 m, 30 Aug 1978, G.M. Stonedahl, *Anaphalis margaritacea* (Asteraceae), 1♂ (AMNH_PBI 00102497), 2♀ (AMNH_PBI 00102498, AMNH_PBI 00102499) (AMNH). ***Umatilla Co.:*** Meacham, 45.50667°N 118.42028°W, 14 Jul 1931, H.T. Peters, 2♂ (AMNH_PBI 00075255, AMNH_PBI 00075256) (KU); 14 Jul 1931, R.H. Beamer, 1♂ (AMNH_PBI 00075254) (KU). ***Union Co.:*** 6 mi NW of Medical Springs, summit of Wallowa Mountains, Wallowa-Whitman National Forest T5S R41E Sec27, 45.017°N 117.6758°W, 1073 m, 29 Jul 1994, M.D. Schwartz, *Lupinus leucophyllus* Dougl. (Fabaceae), 1♂ (AMNH_PBI 00103895), 2♀ (AMNH_PBI 00103897, AMNH_PBI 00103898) (CNC). Elgin, 45.56486°N 117.9174°W, 21 Jul 1929, H.A. Scullen, *Monardella villosa* (Lamiaceae), 1♂ (AMNH_PBI 00107169) (USNM). La Grande, 45.32472°N 118.08667°W, 26 Jun 1926, E.W. Davis, 2♂ (AMNH_PBI 00107094, AMNH_PBI 00107095), 3♀ (AMNH_PBI 00107101–AMNH_PBI 00107103) (USNM). ***Unknown Co.:*** Dixie, 08 Jul 1931, J. Nottingham, 1♀ (AMNH_PBI 00075263) (KU). Long creek, 01 Jul 1935, J. Schuh, 1♂ (AMNH_PBI 00102480) (AMNH). **South Dakota:** ***Lawrence Co.:*** Black Hills, 44.41667°N 103.70833°W, 28 Jun 1937, H.M. Harris, 1♀ (AMNH_PBI 00107204) (USNM). Deadwood, 44.37667°N 103.72917°W, 29 Jul 1927, H.H. Knight, 1♂ (AMNH_PBI 00107092), 2♀ (AMNH_PBI 00107099, AMNH_PBI 00107100) (USNM). ***Meade Co.:*** Piedmont, 44.23165°N 103.389°W, 1065 m, 17 Jul 1937, C.L. Johnston, 1♀ (AMNH_PBI 00075278) (KU). **Utah:** ***Box Elder Co.:*** 5 mi SW of Clear Creek Campground, Raft River Mountains, 41.94517°N 113.35486°W, 2164 m, 31 Jul 1981, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00102525) *Holodiscus discolor* (Rosaceae), 1♂ (AMNH_PBI 00102469) (AMNH). Raft River Mountains, 5 mi SW Clear Crk. Cmpgrd. T14N R13N, 41.99118°N 113.64017°W, 2164 m, 31 Jul 1981, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102777) (AMNH). ***Cache Co.:*** Wellsville, 41.63861°N 111.93306°W, 17 Jun 1940, G.F. Knowiten and M.J. Janes, 1♂ (AMNH_PBI 00107168) (USNM). ***SanJuan Co.:*** Geyser Creek, near Taylor Flats, 38.49469°N 109.09081°W, 04 Jul 1980, J.T. and D.A. Polhemus, 2♀ (AMNH_PBI 00065090, AMNH_PBI 00065091) (JTP). ***Sanpete Co.:*** 13 mi E of Fairview on Rt 31, T14S R6E, 39.61952°N 111.28186°W, 2286 m, 08 Aug 1981, M.D. Schwartz, *Conyza canadensis* (L.) Cronq. (Asteraceae), 1♂ (AMNH_PBI 00102468) (AMNH). ***Sevier Co.:*** Monroe, 38.63°N 112.12°W, 25 Jul 1906, collector unknown, 1♀ (AMNH_PBI 00106614) (USNM). ***Summit Co.:*** 4.5 mi E of Oakley, Weber Canyon Road, 40.71472°N 111.21417°W, 19 Aug 1986, G.M. Stonedahl, *Cercocarpus* sp. (Rosaceae), 1♀ (AMNH_PBI 00102529) (AMNH). ***Uintah Co.:*** 5–10 mi SW of Bonanza, T10S R24E Sec 17 (R2), 39.9456°N 109.2406°W, 1615 m, 08 Jul 1982, M.D. Schwartz, *Sarcobatus vermiculatus* (Sarcobataceae), 1♀ (AMNH_PBI 00102418) (AMNH). 5–10 mi SW of Bonanza, T10S R24E Sec 17 (R4), 39.9456°N 109.2406°W, 1615 m, 05 Jul 1982, M.D. Schwartz, *Sarcobatus vermiculatus* (Sarcobataceae) (Hook.) Torr. (Sarcobataceae), 8♂ (AMNH_PBI 00102054, AMNH_PBI

00102408–AMNH_PBI 00102412, AMNH_PBI 00102776, AMNH_PBI 00102794), 9♀ (AMNH_PBI 00102413–AMNH_PBI 00102417, AMNH_PBI 00102419–AMNH_PBI 00102421, AMNH_PBI 00102756) (AMNH). ***Weber Co.:*** Weber Canyon, 41.13578°N 111.90382°W, 04 Jul 1931, M.W. Sanderson, 1♀ (AMNH_PBI 00075264) (KU). ***Unknown Co.:*** Dry Lake, 25 Jul 1938, G.F. Knowlton, 1♀ (AMNH_PBI 00107174) (USNM). **Washington:** ***Asotin Co.:*** 2.5 mi S of Anatone, 2 mi N Rattlesnake Summit, 46.09885°N 117.13139°W, 1189 m, 04 Aug 1986, Schuh, Schwartz, and Stonedahl, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102644) (AMNH). ***Chelan Co.:*** Leavenworth, 47.59623°N 120.6614°W, 07 Jul 1933–09 Jul 1933, Wickham, 1♂ (AMNH_PBI 00107129) (USNM). Wenatchee, 47.42345°N 120.3103°W, 14 Jun 1915, E.J. Newcomer, 1♀ (AMNH_PBI 00107173) (USNM). ***Columbia Co.:*** Dayton, 46.32389°N 117.97139°W, 1447 m, 06 Jul 1937, R.E. Miller, 2♂ (AMNH_PBI 00107096, AMNH_PBI 00107097), 2♀ (AMNH_PBI 00107104, AMNH_PBI 00107105) (USNM). ***Cowlitz Co.:*** Kalama R[iver], 46.03372°N 122.87038°W, 21 Jul 1931, R.H. Beamer, 1♂ (AMNH_PBI 00075260) (KU). ***Ferry Co.:*** Republic, 48.64833°N 118.73667°W, 06 Aug 1931, H.T. Peters, 1♂ (AMNH_PBI 00075257), 1♀ (AMNH_PBI 00075277) (KU). ***Kittitas Co.:*** Cliffdell, 46.94639°N 121.06778°W, 07 Jul 1935, R.H. Beamer, 1♂ (AMNH_PBI 00075253) (KU). ***Okanogan Co.:*** 8 mi WNW of Republic (Ferry Co.), Sweat Creek, 48.42324°N 119.83129°W, 1097 m, 20 Jul 1978, N. Herman, 1♂ (AMNH_PBI 00102465) (AMNH). ***Pierce Co.:*** Mount Rainier, cotton fields, 46.8833°N 122.88333°W, 07 Jul 1935, Oman, 1♀ (AMNH_PBI 00107134) (USNM). ***Whitman Co.:*** Pullman, 46.73139°N 117.17861°W, 29 Aug 1909, J.A. Hyslop, 1♀ (AMNH_PBI 00107175) (USNM); 14 Jul 1911, collector unknown, 1♂ (AMNH_PBI 00107124) (USNM); 24 Jul 1908, W.M. Mann, 1♂ (AMNH_PBI 00107125), 2♀ (AMNH_PBI 00107131, AMNH_PBI 00107133) (USNM); 30 Jul 1909, J.A. Hyslop, 2♂ (AMNH_PBI 00107126, AMNH_PBI 00107128) (USNM); 17 Jul 1908, W.M. Mann, 1♂ (AMNH_PBI 00107127) (USNM); 08 Jul 1908, W.M. Mann, 1♀ (AMNH_PBI 00107132) (USNM); 02 Aug 1908, W.M. Mann, 1♂ (AMNH_PBI 00107153) (USNM); 02 Aug 1908, W.M. Mann, 1♂ (AMNH_PBI 00105186) (CNC). ***Yakima Co.:*** 10 mi N of Yakima, 46.73297°N 120.45236°W, 04 Jul 1978, J. Schuh & R. Rieder, 1♂ (AMNH_PBI 00102464) (AMNH). Naches, 46.73111°N 120.69833°W, 07 Jul 1935, R.H. Beamer, 1♀ (AMNH_PBI 00075262) (KU). Tieton Canyon, 46.65217°N 120.7248°W, 21 Jun 1932, A.R. Rolfs, 1♂ (AMNH_PBI 00106286) (TAMU). Toppenish, 46.3775°N 120.3075°W, 12 Jun 1926, E.W. Davis, 1♂ (AMNH_PBI 00107157) (USNM); 15 May 1926, E.W. Davis, 1♀ (AMNH_PBI 00107185) (USNM). Yakima, 46.60222°N 120.50472°W, 11 Aug 1932, A.R. Rolfs, 1♂ (AMNH_PBI 00106287) (TAMU); 21 Aug 1931, A.R. Rolfs, 1♂ (AMNH_PBI 00107160), 1♀ (AMNH_PBI 00107187) (USNM); 01 May 1931, A.R. Rolfs, 1♂ (AMNH_PBI 00107161) (USNM). **Wyoming:** ***Albany Co.:*** 40 mi NE of Laramie, 41.80783°N 105.28074°W, 13 Jul 1937, R.H. Beamer, 5♂ (AMNH_PBI 00075267–AMNH_PBI 00075271), 4♀ (AMNH_PBI 00075280–AMNH_PBI 00075283) (KU). ***Big Horn Co.:*** Big Horn Mountains, 44.75499°N 107.78239°W, 1981 m, 17 Aug 1927, H.H. Knight, 1♀ (AMNH_PBI 00107182) (USNM). ***Crook Co.:*** Sundance, 44.40639°N 104.37528°W, 30 Jul 1927, H.H. Knight, 1♂ (AMNH_PBI 00105187) (CNC). 7♂ (AMNH_PBI 00107085–AMNH_PBI 00107091), 7♀ (AMNH_PBI 00107112–AMNH_PBI 00107116, AMNH_PBI 00107118, AMNH_PBI 00107119) (USNM). ***Fremont Co.:*** Shoshone National Forest, 43.80913°N 109.56306°W, 14 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00125480) (CUIC); 15 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00107302) (USNM). ***Johnson Co.:*** Fort McKinley, 44.33932°N 106.73531°W, Jul 1883, collector unknown, 1♂ (AMNH_PBI 00107167) (USNM). ***Lincoln Co.:*** Salt River Pass, 15 mi S of Afton on Rt 89, 42.54234°N 110.89431°W, 2326 m, 21 Jul 1981, M.D. Schwartz, *Artemisia tridentata* (Asteraceae), 1♀ (AMNH_PBI 00102526) *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102764) (AMNH). Snake River, 18 mi E Alpine, 43.23°N 110.77°W, 12 Aug 1949, W.J. and J.W. Gertsch, 1♂ (AMNH_PBI 00102795) (AMNH). ***Park Co.:*** 19 mi E of Cooke City on Rt 212, 44.93593°N 109.62787°W, 2438 m, 11 Aug 1986, Schuh, Schwartz, and Stonedahl, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102511), 1♀ (AMNH_PBI 00102515) (AMNH). National Park [Yellowstone], 44.76667°N 110.23333°W, collector unknown,

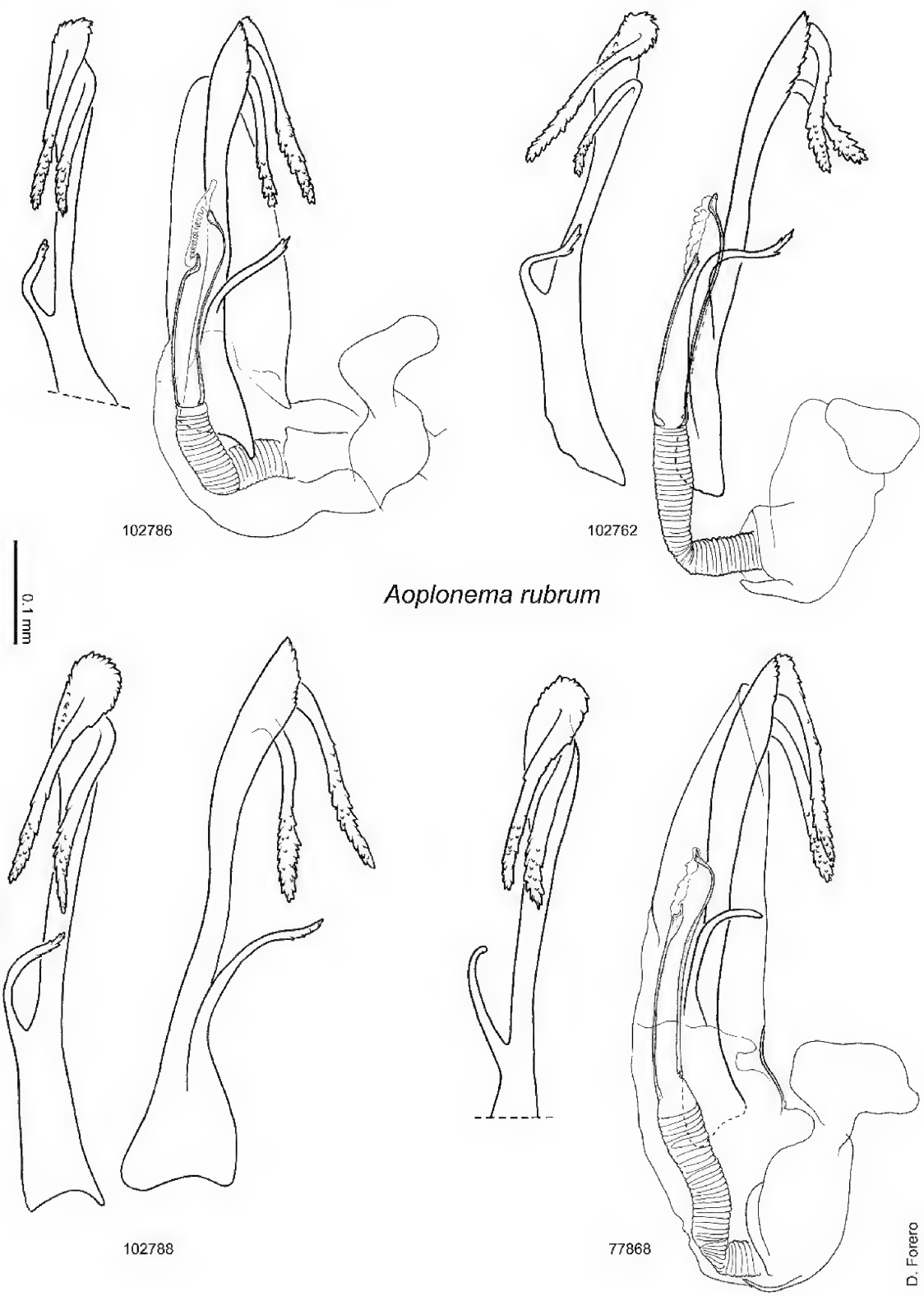
1♀ (AMNH_PBI 00107176) (USNM); O. Heidemann, 1♂ (AMNH_PBI 00125481), 1♀ (AMNH_PBI 00125483) (CUIC); 26 Jul 1891, collector unknown, 1♂ (AMNH_PBI 00125482) (CUIC); 26 Jul 1891, O. Heidemann, 2♀ (AMNH_PBI 00125484, AMNH_PBI 00125485) (CUIC). Shoshone National Forest, 44.00028°N 109.50028°W, 07 Aug 1927, H.H. Knight, 2♂ (AMNH_PBI 00107083, AMNH_PBI 00107084) (USNM); 14 Aug 1927, H.H. Knight, 1♀ (AMNH_PBI 00106290) (TAMU). 19♂ (AMNH_PBI 00107064–AMNH_PBI 00107082), 5♀ (AMNH_PBI 00107108–AMNH_PBI 00107111, AMNH_PBI 00107117) (USNM). Sunlight Creek, 44.69467°N 109.82018°W, 31 Jul 1896, R.P. Currie, 1♀ (AMNH_PBI 00107149) (USNM). Yellowstone National Park, 44.76667°N 110.23333°W, 08 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00107162), 1♀ (AMNH_PBI 00107188) (USNM).Yellowstone National Park, 44.76667°N 110.23333°W, 04 Aug 1931, H.H. Knight, 1♂ (AMNH_PBI 00107301), 1♀ (AMNH_PBI 00107178) (USNM). ***Sheridan Co.:*** SW of Sheridan, 44.79722°N 106.95556°W, 16 Aug 1979, J.T. Polhemus, 1♀ (AMNH_PBI 00065103) (JTP). ***Sweetwater Co.:*** Green River Lake, 41.52299°N 109.46945°W, 2591 m, 01 Aug 1935, H. Ruckes, 1♂ (AMNH_PBI 00107196), 1♀ (AMNH_PBI 00107202) (USNM). ***Teton Co.:*** Grand Teton National Park, 2 mi SE Colter Bay Village, St. 89, 43.87622°N 110.61996°W, 2134 m, 22 Jul 1981, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 4♂ (AMNH_PBI 00101208, AMNH_PBI 00102500–AMNH_PBI 00102502), 8♀ (AMNH_PBI 00102503–AMNH_PBI 00102510) (AMNH). Stewart R. Sta., F 4749, 43.7°N 110.75°W, 2042 m, 18 Jul 1920, collector unknown, 1♂ (AMNH_PBI 00102461) (AMNH). **Unknown state:** ***Unknown Co.:*** Olmstead, 1♂ (AMNH_PBI 00102484) (AMNH). Western Territories, 1♂ (AMNH_PBI 00107130), 2♀ (AMNH_PBI 00107140, AMNH_PBI 00107141) (USNM).

Aoplonema rubrum, sp. nov.
Figures 1, 5, 6, 8, 9, 13

DIAGNOSIS: Recognized by red coloration of the femora (fig. 1); the large eyes reaching the dorsal margin of the head; the short anteocular region (fig. 5); the long hemelytra and cuneus (fig. 1); the relatively large genital capsule and aedeagus (fig. 6); and the vesica, with rami of left portion long and the right lateral portion directed medially (fig. 13).

Aoplonema rubrum is similar to *A. nigrum* in having large eyes, an elongate hemelytra, and a long cuneus, but it is distinguished from *A. nigrum* by the red coloration of the femora, the structure of the right portion of the vesica, which is turned medially, and the longer rami of the left portion. *Aoplonema rubrum* shares with *A. princeps* a similar vesica structure (fig. 13), but it is separated from *A. princeps* by the shorter anteocular region, the larger eyes (fig. 5), the longer hemelytra and cuneus (fig. 1), and the less elevated and impressed calli. As in the case of *A. nigrum*, identification of *A. rubrum* females can only be made by their association with males.

DESCRIPTION: *Male:* Delicate, large, total length 5.11–5.98. COLORATION (fig. 1): HEAD: Black; vertex and frons sometimes with two lateral and one central weakly reddish longitudinal areas; maxillary and mandibular plates sometimes red; gula sometimes red or reddish black; labrum dark brown; labium dark brown, segment I reddish; antennae black. THORAX: Collar, pronotum, mesoscutum, and scutellum red, sometimes collar and anterior margin of pronotum darker; calli suffused with black, sometimes almost completely black; proepisternum and proepimeron red; mesepisternum, mesepimeron, and metepisternum red, sometimes suffused with black; venter reddish black or black. *Hemelytra:* Dark brown with pale costal margins; membrane and veins brown. *Legs:* Coxae, trochanters, and femora red; tibiae and tarsi black or dark brown. ABDOMEN: Black, sometimes reddish black. GENITALIA: Genital capsule and parameres black; proctiger dark brown or reddish brown. STRUCTURE: HEAD: Strongly declivent; anteocular region short, about a third of head length; frons weakly convex, nearly flat; gula shorter than buccula; eyes large, reaching dorsal margin of head in lateral view, interocular distance small (fig. 5, table 1). THORAX: Calli on pronotum nearly flat. *Hemelytra:* Nearly parallel; cuneus nearly flat, much longer than wide (fig. 1). GENITALIA: Genital capsule relatively large (fig. 6); parameres as in figure 6; left portion


102786
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Aoplonema rubrum
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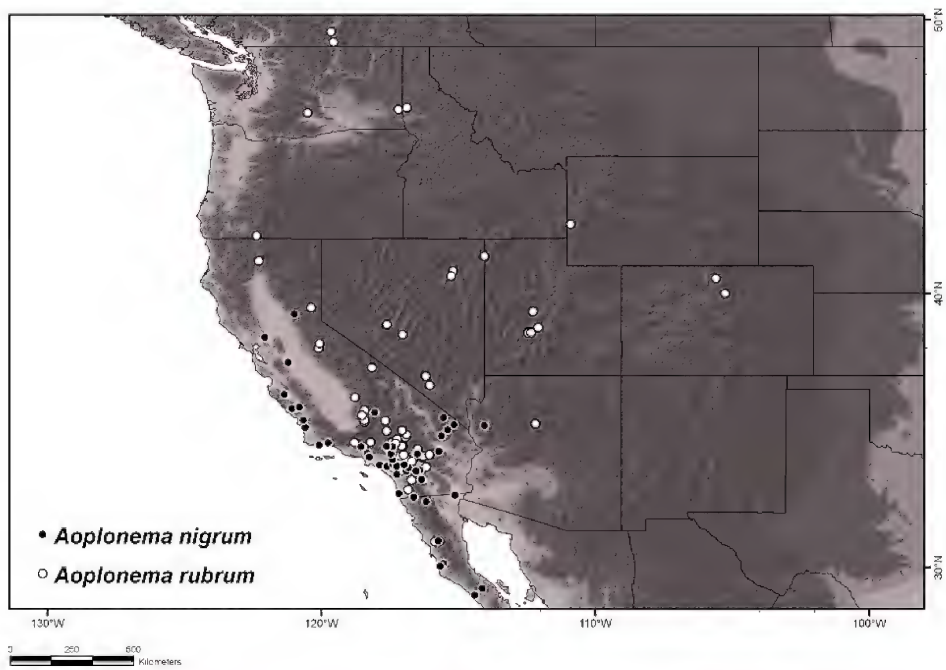

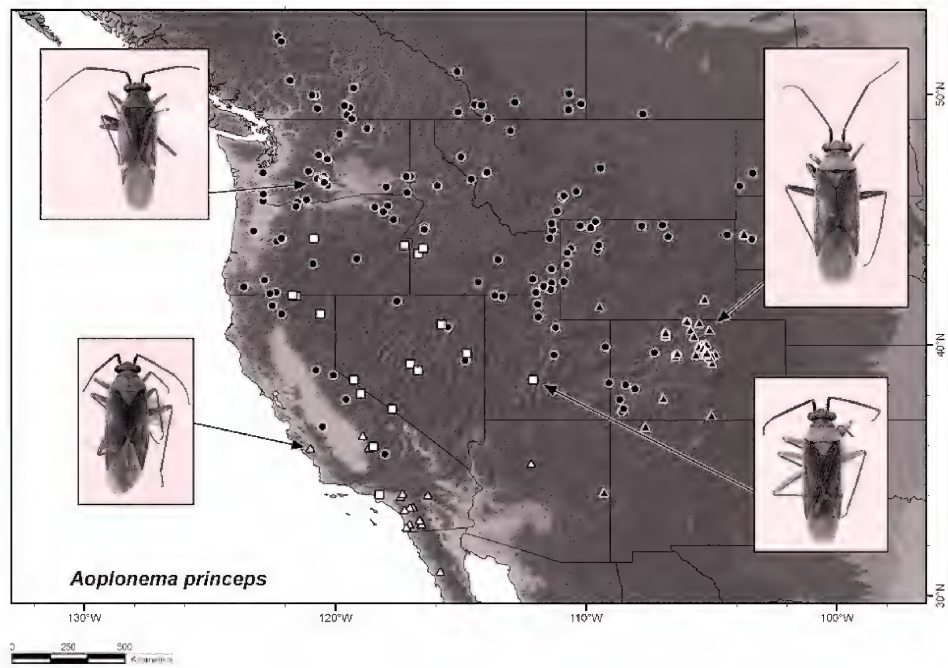

Fig. 14. Distribution maps for *Aoplonema nigrum*, *A. rubrum*, and *A. princeps*. *A. princeps* map shows dorsal illustrations of population variants (see text for details).

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Fig. 13. *Aoplonema rubrum*. Male genitalia: phallus and vesica showing variation across geographic range, dorsal and lateral views.

of vesica compressed dorsoventrally at apex, strongly denticulate, rami long and heavily denticulate apically, nearly reaching apex of right portion (fig. 13); right portion strongly curved upward, sometimes apically sinuate, directed to the left, variously denticulate at apex (fig. 13).

Female: Similar to male but shorter, ovoid, total length 3.84–5.15. COLORATION: Similar to male (fig. 1). ABDOMEN: Reddish black or black; ovipositor reddish. STRUCTURE: GENITALIA: Interramal sclerites and dorsal lobe of interramal sclerite as in figure 8, sigmoid process bluntly denticulate (fig. 8); sclerotized rings subrectangular, posterior margin medially produced as an acute process, medial margin produced cephalad, accessory sclerite enlarged, rounded, and denticulate at apex (fig. 8); anterior wall and inner margins of first gonapophyses as in figure 9.

DISTRIBUTION: *A. rubrum* has a broad distribution ranging from British Columbia (Canada) in the north to Baja California (Mexico) in the south, and from the Rocky Mountains to the West Coast. Most of the locality records are concentrated in southern California (fig. 14).

HOSTS: *A. rubrum* has been associated with a great variety of plants. Available data make it difficult to assess actual breeding hosts. Judging by the numbers of specimens found on each plant species, *A. rubrum* may breed primarily on *Purshia* spp. (Rosaceae) and *Ceanothus* spp. (Rhamnaceae), with occasional occurrences on Fabaceae and Asteraceae. I have also examined some males associated with cantharidin traps.

ETYMOLOGY: The species name if from the Latin "rubrum", painted red, and refers to the overall coloration of the legs.

DISCUSSION: This new species has been confused in collections under *A. princeps* (as *A. uhleri*). Some of the specimens of *A. rubrum* have been found at the same localities as *A. nigrum* (fig. 14), in particular in southern California, where both species are common, although they are not always present in the same localities.

HOLOTYPE MALE: **USA: California: *Inyo Co.:*** 3.5 mi W of Westgard Pass Summit on Route 168, [37.30028°N 118.15306°W], 2188 m, 12 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Purshia glandulosa* Curran (Rosaceae), det. B. Ertter 1980, Holotype *Aoplonema rubrum*, n. sp. D. Forero det. (red label), 1♂ (AMNH_PBI 00102296) (AMNH).

PARATYPES: **CANADA: British Columbia:** Oliver, McIntyre Creek, 49.18333°N 119.55°W, 04 Jul 1959, L.A. Kelton, *Sarcobatus* sp. (Sarcobataceae), 6♂ (AMNH_PBI 00105163–AMNH_PBI 00105168), 1♀ (AMNH_PBI 00105169) (CNC). Oliver, Sawmill Lake, 49.18333°N 119.55°W, 30 Jun 1959, L.A. Kelton, *Ceanothus* sp. (Rhamnaceae), 3♂ (AMNH_PBI 00105159–AMNH_PBI 00105161), 1♀ (AMNH_PBI 00105162) (CNC). Summerland, 49.56646°N 119.63951°W, 400 m, 02 Jul 1974–11 Jul 1974, L.A. Kelton, *Ceanothus* sp. (Rhamnaceae), 2♂ (AMNH_PBI 00105170, AMNH_PBI 00105171), 1♀ (AMNH_PBI 00105172) (CNC). **MEXICO: Baja California:** 22 km W of Parque Sierra San Pedro Martir, 30.96°N 115.85°W, 1150 m, 25 Apr 1985, R.T. Schuh and B.M. Massie, *Lotus scoparius* (Nott.) Ottley (Fabaceae), 1♀ (AMNH_PBI 00102201) *Adenostoma fasciculatum* Hooker and Arnott (Rosaceae), 1♂ (AMNH_PBI 00102197) (AMNH). 3 mi NW of Villa Juarez, 32.64745°N 115.11988°W, 28 Apr 1963, H.B. Leech and P.H. Arnaud, Jr., 1♂ (AMNH_PBI 00107236) (USNM). 7 km W of Parque Sierra San Pedro Martir, 30.97°N 115.68°W, 1720 m, 25 Apr 1985, R.T. Schuh and B.M. Massie, *Ceanothus cuneatus* (Rhamnaceae), 1♂ (AMNH_PBI 00107039) (AMNH). **USA: Arizona: *Coconino Co.:*** Williams, 35.24944°N 112.19028°W, 2134 m, 24 Jun 1925, A.A. Nichol, 1♂ (AMNH_PBI 00107235) (USNM). **California: *Inyo Co.:*** 3.5 mi W Westgard Pass Summit, 37.30028°N 118.15306°W, 2134 m, 12 Jul 1980, G.M. Stonedahl, *Purshia tridentata* (Rosaceae), 14♂ (AMNH_PBI 00101217–AMNH_PBI 00101230), 8♀ (AMNH_PBI 00101235–AMNH_PBI 00101242), light trap, 2♂ (AMNH_PBI 00101216, AMNH_PBI 00101217) (AMNH). 3.5 mi W of Westgard Pass Summit on Route 168, 37.30028°N 118.15306°W, 2188 m, 12 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Purshia glandulosa* Curran (Rosaceae), det. B. Ertter 1980, 23♂ (AMNH_PBI 00102295, AMNH_PBI 00102297–AMNH_PBI 00102317, AMNH_PBI 00102335), 18♀ (AMNH_PBI 00102318–AMNH_PBI 00102333, AMNH_PBI 00102344, AMNH_PBI 00102797) *Purshia glandulosa*

Curran (Rosaceae), det. B. Ertter 1980, 1♂ (AMNH_PBI 00102762) (AMNH). ***Kern Co.:*** E of Caliente on Caliente Creek Rd, Twin Oaks, 35.30702°N 118.4233°W, 836 m, 22 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Juniperus californica* Carr. (Cupressaceae), det. A. Sanders UCR140634, 1♂ (AMNH_PBI 00102363) (AMNH). E of Caliente on Walker Basin Road, 35.38774°N 118.425°W, 1220 m, 22 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Ceanothus* sp. (Rhamnaceae), det. Field ID, 3♂ (AMNH_PBI 00102381–AMNH_PBI 00102383), 2♀ (AMNH_PBI 00102385, AMNH_PBI 00102386) (AMNH). Randsburg, T29S R40E S35, 35.36861°N 117.65722°W, 08 Apr 1985, M. Clement, 2♂ (AMNH_PBI 00083082, AMNH_PBI 00083083) (UCR). Randsburg, site 2, 35.36861°N 117.65722°W, in catharidin trap, 1♂ (AMNH_PBI 00133866) (USNM). S of Bodfish on Caliente-Bodfish Road, 35.56089°N 118.5053°W, 1094 m, 22 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Fremontodendron californicum* (Torr.) Corville (Sterculiaceae), det. Field ID, 1♀ (AMNH_PBI 00102388) *Cercocarpus betuloides* Torr. and A. Gray (Rosaceae), det. A. Sanders UCR140632, 1♂ (AMNH_PBI 00102384) (AMNH). Near Kernville, Headquarters Camp, Sequoia National Forest, 35.75472°N 118.42444°W, 18 Jun 1993, W.F. Chamberlain, 3♂ (AMNH_PBI 00105574–AMNH_PBI 00105576), 5♀ (AMNH_PBI 00105578–AMNH_PBI 00105582) (TAMU). ***Los Angeles Co.:*** 5 mi W of Palmdale, 34.57944°N 118.20335°W, 14 Apr 1932, E.P. Van Duzee, 1♂ (AMNH_PBI 00077890) (CAS). Solemint, Mint Canyon, 34.41528°N 118.45278°W, 28 Apr 1955, W.R. Richards, 1♀ (AMNH_PBI 00105035) (CNC); 28 Apr 1955, W.R.M. Mason, 2♂ (AMNH_PBI 00105033, AMNH_PBI 00105034) (CNC); 28 Apr 1955, J.E.H. Martin, 2♀ (AMNH_PBI 00105038, AMNH_PBI 00105039) (CNC). ***Riverside Co.:*** Coachella Valley, 33.6803°N 116.17389°W, 07 Apr 1920, R.S. Woglun, 1♂ (AMNH_PBI 00083088), 1♀ (AMNH_PBI 00083093) (UCR). Menifee Valley, hills on W end, 33.72833°N 117.14556°W, 549 m, 09 May 1978, J.D. Pinto, light trap, 1♂ (AMNH_PBI 00083115) (UCR). Millard Canyon, 33.94361°N 116.795°W, 890 m, 20 Apr 1968, L.O. Tejada, (Asteraceae), 1♂ (AMNH_PBI 00083091) (UCR). Riverside, 33.95333°N 117.39528°W, 05 Apr 1934, Timberlake, *Lotus scoparius* (Fabaceae), 1♂ (AMNH_PBI 00083107) *Eriogonum fasciculatum* (Polygonaceae), 1♂ (AMNH_PBI 00083106) (UCR). Riverside County, T2S R4E S18, 33.9987°N 116.6085°W, 14 Feb 1987, D.H. Headrick, 1♂ (AMNH_PBI 00083087) (UCR). Snow Creek, 33.89002°N 116.68418°W, 09 Apr 1981, D.M. Fox, 1♂ (AMNH_PBI 00083085) (UCR). Temecula, 33.49361°N 117.1475°W, 25 Jun 1948, collector unknown, *Cercocarpus* sp. (Rosaceae), 1♂ (AMNH_PBI 00083089) (UCR). Timico Acres, T3N R5E S20, 34.3318°N 116.4833°W, 1030 m, 27 Apr 1988, R.D. Goeden and D.W. Ricker, *Encelia actoni* (Asteraceae), 2♂ (AMNH_PBI 00107233, AMNH_PBI 00107234) (USNM). Wilson Valley Road, 1 mi N of Hemet, 33.762°N 116.97111°W, 21 Apr 1980, L. Russell and M.D. Schwartz, *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00102786) (AMNH). ***San Bernardino Co.:*** 1.5 mi W of Kramer Junction, 34.99444°N 117.61147°W, 21 Apr 1980, L. Russell and M.D. Schwartz, *Salvia* sp. (Lamiaceae), 1♂ (AMNH_PBI 00102788) (AMNH). 17.6 mi S of Barstow on Rt 247, 34.64417°N 117.02194°W, 1060 m, 02 May 1985, R.T. Schuh and B.M. Massie, *Sphaeralcea* sp. (Malvaceae), 1♂ (AMNH_PBI 00102643), 1♀ (AMNH_PBI 00102647) (AMNH). 18 mi N of Lucerne Valley, 34.76446°N 116.92139°W, 03 May 1985, J.D. Pinto, 1♂ (AMNH_PBI 00083492) (UCR). 2 km NW of I-15 on Rt 138, N of San Bernardino, 34.31089°N 117.4971°W, 1555 m, 18 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Fremontodendron californicum* (Torr.) Corville (Sterculiaceae), det. Field ID, 1♂ (AMNH_PBI 00102367) (AMNH). 2 mi E of Camp Angelus, 38.00222°N 120.09941°W, 28 Jun 1978, J.D. Pinto, *Amorpha californica* (Fabaceae), 1♂ (AMNH_PBI 00083084) (UCR). 3 mi SW of Victorville, 34.50533°N 117.32763°W, 09 Aug 1948, Timberlake, *Tetradymia spinosa* (Asteraceae), 2♂ (AMNH_PBI 00083109, AMNH_PBI 00083110), 1♀ (AMNH_PBI 00083117) (UCR). 3 mi W of Lucerne Valley, 34.44389°N 117.01953°W, 05 May 1975, J.D. Pinto, 1♂ (AMNH_PBI 00083090), 3♀ (AMNH_PBI 00083094–AMNH_PBI 00083096)

(UCR). 4 mi SW of Victorville, 34.49507°N 117.34009°W, 06 May 1934, Timberlake, *Ericameria cooperi* (Asteraceae), 1♂ (AMNH_PBI 00083111) (UCR). 5.4 mi W of Lucerne Valley, 34.44389°N 117.0616°W, 935 m, 13 May 1978, J.D. Pinto and R.T. Schuh, *Ericameria nauseosa* (Asteraceae), 1♂ (AMNH_PBI 00101252) (AMNH).Adelanto, 34.58278°N 117.40833°W, 09 Aug 1948, Timberlake, *Hymenoclea salsola* (Asteraceae), 1♂ (AMNH_PBI 00083108) (UCR). Apple Valley, 34.53139°N 117.28278°W, 12 May 1955, W.R.M. Mason, 10♂ (AMNH_PBI 00104973–AMNH_PBI 00104982) (CNC); 19 May 1955, W.R. Richards, 6♀ (AMNH_PBI 00105026–AMNH_PBI 00105031) (CNC); 09 May 1955, W.R. Richards, 6♂ (AMNH_PBI 00104983–AMNH_PBI 00104988), 9♀ (AMNH_PBI 00105012–AMNH_PBI 00105020) (CNC); 11 May 1955, W.R. Richards, light trap, 13♂ (AMNH_PBI 00104989–AMNH_PBI 00105001) (CNC); 06 May 1955, W.R.M. Mason, 1♂ (AMNH_PBI 00105002) (CNC); 08 May 1955, W.R. Richards, 1♂ (AMNH_PBI 00105003), 3♀ (AMNH_PBI 00105021–AMNH_PBI 00105023) (CNC); 08 May 1955, W.R.M. Mason, 1♂ (AMNH_PBI 00105004) (CNC); 09 May 1955, J.E. H. Martin, 1♂ (AMNH_PBI 00105005), 2♀ (AMNH_PBI 00105024, AMNH_PBI 00105025) (CNC); 20 May 1955, J.E.H. Martin, light trap, 3♂ (AMNH_PBI 00105006–AMNH_PBI 00105008) (CNC); 24 May 1955, W.R. Richards, light trap, 1♂ (AMNH_PBI 00105009) (CNC); 14 May 1955, J.E.H. Martin, 2♂ (AMNH_PBI 00105010, AMNH_PBI 00105011) (CNC); 20 May 1955, W.R.M. Mason, 1♀ (AMNH_PBI 00105032) (CNC). Daggett, 34.86331°N 116.88809°W, 13 Apr 1955, J.E.H. Martin, 3♂ (AMNH_PBI 00105054–AMNH_PBI 00105056) (CNC); 14 Apr 1955, W.R.M. Mason, 1♂ (AMNH_PBI 00105057) (CNC). E of Wrightwood on Rt 2, 2 km W of Rt 138, Los Angeles National Forest, 34.37824°N 117.6117°W, 1556 m, 18 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Arctostaphylos glauca* Lindl. (Ericaceae), det. A. Sanders UCR140625, 1♂ (AMNH_PBI 00102366), *Eriodictyon trichocalyx* Heller (Hydrophyllaceae), det. Field ID, 2♀ (AMNH_PBI 00102369, AMNH_PBI 00102370), *Salvia dorrii* (Kell.) Abrams (Lamiaceae), det. Field ID, 1♀ (AMNH_PBI 00102371) (AMNH). Helendale, T7N R3W S18, 34.6966°N 117.2346°W, 29 Apr 1982, R.D. Goeden and D.W. Ricker, *Hymenoclea salsola* (Asteraceae), 1♂ (AMNH_PBI 00083105) (UCR). *Hymenoclea salsola* (Asteraceae), 2♂ (AMNH_PBI 00107226, AMNH_PBI 00107227) (USNM). Joshua Tree National Monument, Lower Covington flat, 34.03779°N 116.30889°W, E.L. Sleeper and M.L. West, 1♂ (AMNH_PBI 00077873), 4♀ (AMNH_PBI 00077876–AMNH_PBI 00077879) (CAS); E.L. Sleeper, 1♂ (AMNH_PBI 00077874), 2♀ (AMNH_PBI 00077880, AMNH_PBI 00077881) (CAS); M. Knox and E. Sleeper, 1♂ (AMNH_PBI 00077875) (CAS); 30 Apr 1960, M. Knox, 1♀ (AMNH_PBI 00077884) (CAS). Joshua Tree National Monument, Smithwater Wash, 34.07259°N 116.27489°W, 30 Apr 1960, E.L. Sleeper, 2♀ (AMNH_PBI 00077882, AMNH_PBI 00077883) (CAS). Mill Creek, San Bernardino Mountains, 34.08721°N 117.11396°W, 1829 m, 04 Jul 1961, Timberlake, *Ceanothus cordulatus* (Rhamnaceae), 1♂ (AMNH_PBI 00083112) (UCR); 12 Jul 1961, Timberlake, *Ceanothus cordulatus* (Rhamnaceae), 1♂ (AMNH_PBI 00083113) (UCR). Mountain Home, 34.12057°N 116.99669°W, 04 Jul 1935, Timberlake, *Eriodictyon trichocalyx* (Hydrophyllaceae), 1♂ (AMNH_PBI 00083114) (UCR). NW of Pioneertown, T1N R4E S12, 34.1844°N 116.5269°W, 1280 m, 03 May 1994, M. Cooperband, 1♀ (AMNH_PBI 00083497) (UCR). NW of Pioneertown, T1N R4E S13, 34.1731°N 116.5173°W, 27 Apr 1993, Ali Al-Wahaibi, 1♀ (AMNH_PBI 00083499) (UCR). Pioneertown, UC Burns Reserve, 34.15667°N 116.4961°W, 1350 m, 25 Apr 1995, J. Freilich, 3♂ (AMNH_PBI 00083489–AMNH_PBI 00083491) (UCR). Rainbow Basin, T11N R2W S26, 35.0168°N 117.0583°W, 29 Apr 1982, R.D. Goeden and D.W. Ricker, *Hymenoclea salsola* (Asteraceae), 1♂ (AMNH_PBI 00083104), 1♀ (AMNH_PBI 00083116) (UCR). S of Pioneertown, Skyline Ranch Road, 34.1545°N 116.48479°W, 25 Apr 1995, Katryn Schiro, 1♀ (AMNH_PBI 00083498) (UCR). Twentynine Palms, 34.13556°N 116.05333°W, 27 Apr 1982, Kevin Grangetto, 2♂ (AMNH_PBI 00083086, AMNH_PBI 00083092), 7♀ (AMNH_PBI 00083097–AMNH_PBI 00083103) (UCR). Victorville, 34.53611°N 117.29028°W, 09 May 1955, W.R.M. Mason, 5♂ (AMNH_PBI 00105045–AMNH_PBI 00105049), 4♀ (AMNH_PBI 00105050–AMNH_PBI 00105053) (CNC).

Just E of Wrightwood on Rt 2, 34.35774°N 117.6105°W, 1700 m, 18 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Prunus fasciculata* (Torr.) Gray (Rosaceae), det. Field ID, 1♂ (AMNH_PBI 00102364) *Purshia glandulosa* Curran (Rosaceae), det. Field ID, 1♂ (AMNH_PBI 00102365) (AMNH). ***San Diego Co.:*** Anza-Borrego Desert State Park, Palm Canyon Campground, 33.22111°N 116.33333°W, 180 m, 16 May 1982, M.D. Schwartz, *Purshia tridentata* (Rosaceae), 2♂ (AMNH_PBI 00101253, AMNH_PBI 00101254) (AMNH). Carrizo Creek, intersection with Rt 79, 7 mi S of Warner Springs, 33.19988°N 116.71081°W, 16 May 1982, M.D. Schwartz, *Gutierrezia sarothrae* (Pursh) Britt. and Rusby (Asteraceae), 1♂ (AMNH_PBI 00102689) (AMNH). McClain Valley, T14S R6E S11, 32.84866°N 116.8269°W, 510 m, 19 Apr 1994, M. Cooperband, 1♂ (AMNH_PBI 00083518) (UCR). Tecate, 32.57728°N 116.62751°W, 20 May 1964, R. Duke, 1♂ (AMNH_PBI 00107233) (USNM). ***Sierra Co.:*** 6 mi S of Sierraville, 39.50275°N 120.36639°W, 06 Aug 1995, W.F. Chamberlain, light trap, 1♂ (AMNH_PBI 00105577) (TAMU). ***Siskiyou Co.:*** Dunsmuir, 41.20821°N 122.27195°W, 29 Jul 1935, R.H. Beamer, 1♂ (AMNH_PBI 00075274) (KU). ***Tulare Co.:*** NE of Springville on Bear Creek Rd near Scicon, 36.21394°N 118.7716°W, 700 m, 23 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, 1♀ (AMNH_PBI 00102392) *Arctostaphylos viscida* Parry (Ericaceae), det. A. Sanders UCR140624, 1♀ (AMNH_PBI 00102392) *Ceanothus cuneatus* (Hook.) Nutt. (Rhamnaceae), det. A. Sanders UCR140622, 3♂ (AMNH_PBI 00102389–AMNH_PBI 00102391), 1♀ (AMNH_PBI 00102393) (AMNH). ***Tuolumne Co.:*** 4 mi W of Pinecrest, 38.18859°N 120.0635°W, 17 Jul 1961, J.G. Rozen, 1♂ (AMNH_PBI 00102337) (AMNH). ***Unknown Co.:*** Red Mountain, 16 May 1955, J.E.H. Martin, 2♂ (AMNH_PBI 00105040, AMNH_PBI 00105041), 1♀ (AMNH_PBI 00105042) (CNC); 11 May 1955, W.R. Richards, 2♀ (AMNH_PBI 00105043, AMNH_PBI 00105044) (CNC). **Colorado:** ***Larimer Co.:*** Pingree Park road at jct. w. Colo. 14, 40.56111°N 105.59722°W, 14 Jul 1986, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00065173) (JTP). **Idaho:** ***Latah Co.:*** Moscow Mountain, 46.80361°N 116.86778°W, 31 Jul 1972, L.A. Kelton, *Ceanothus* sp. (Rhamnaceae), 10♂ (AMNH_PBI 00105173–AMNH_PBI 00105182), 2♀ (AMNH_PBI 00105183, AMNH_PBI 00105184) *Medicago sativa* (Fabaceae), 1♀ (AMNH_PBI 00105185) (CNC). **Nevada:** ***Elko Co.:*** 18 mi SE of Halleck on Rt 11, Secret Canyon, T34N R60E Sec15, 40.829°N 115.1915°W, 1905 m,26 Jul 1982, M.D. Schwartz, *Purshia mexicana* (Rosaceae), 3♂ (AMNH_PBI 00101255–AMNH_PBI 00101256, AMNH_PBI 00102780), 2♀ (AMNH_PBI 00101262, AMNH_PBI 00101263) *Purshia mexicana* (Rosaceae), 1♂ (AMNH_PBI 00101209) (AMNH). 30 mi SE of I-80 on Hwy 229, 40.63882°N 115.26676°W, 1908 m, 19 Jul 1980, G.M. Stonedahl, *Purshia tridentata* (Rosaceae), 2♂ (AMNH_PBI 00101231, AMNH_PBI 00101232), 1♀ (AMNH_PBI 00101243) (AMNH). ***Lincoln Co.:*** 5 mi NE of jct of Rt 38 and Rt 93, 762 m, 19 May 1982, M.D. Schwartz, *Grayia spinosa* (Chenopodiaceae), 1♂ (AMNH_PBI 00102428), 1♀ (AMNH_PBI 00102456) (AMNH). ***Nye Co.:*** 3.5 mi SE of Manhattan, Toiyabe National Forest, 38.50311°N 117.02678°W, 2134 m, 13 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Purshia stansburiana* (Torr.) Henrickson (Rosaceae), det. B. Ertter (1980), 1♂ (AMNH_PBI 00102641) (AMNH). Atomic Test Site, 2 mi W of Tippapah Hwy on Mine Mountain Rd, 36.99111°N 116.18036°W, 1341 m, 07 Jun 1983, Schuh, Schwartz, and Stonedahl, *Purshia stansburiana* (Torr.) Henrickson (Rosaceae), 1♂ (AMNH_PBI 00102425) (AMNH). Atomic Test Site, 2.6 mi W of Mercury Hwy, Cane Springs Rd (A5), 36.66056°N 116.04046°W, 1036 m, 06 Jun 1983, Schuh, Schwartz, and Stonedahl, *Chrysothamnus viscidiflorus* (Hook.) Nutt. (Asteraceae), 1♂ (AMNH_PBI 00102424) (AMNH). Atomic Test Site, Tweezer Rd at Orange Blossom Rd. (A6), 41.3692°N 114.04281°W, 1448 m, 08 Jun 1983, Schuh, Schwartz, and Stonedahl, *Tetradymia* sp. (Asteraceae), 1♂ (AMNH_PBI 00102422), 2♀ (AMNH_PBI 00102429, AMNH_PBI 00102430) (AMNH). Berlin Ichthyosaur State Monument on Rt 844, 38.88194°N 117.60667°W, 1935 m, 01 Jul 1983, R.T. Schuh and M.D. Schwartz, *Symphoricarpos longiflorus* A. Gray (Caprifoliaceae), 1♂ (AMNH_PBI 00102423), 4♀ (AMNH_PBI 00102443–AMNH_PBI 00102446) (AMNH). **Oregon:** ***Jackson Co.:*** 0.5 mi E of Pinehurst, 42.11778°N 122.35525°W, 1082 m, 27 Jun 1979, M.D. Schwartz, *Ceanothus*

cuneatus (Hook.) Nutt. (Rhamnaceae), 1♂ (AMNH_PBI 00101251), 4♀ (AMNH_PBI 00101257–AMNH_PBI 00101260) (AMNH). **Utah:** ***Sevier Co.:*** 2.3 mi N of I-70 on road to Kanosh, 38.60638°N 112.45206°W, 2128 m, 16 Jul 1980, G.M. Stonedahl, *Quercus* sp. (Fagaceae), 1♂ (AMNH_PBI 00102781); *Artemisia* sp. (Asteraceae), 1♂ (AMNH_PBI 00101233), 7♀ (AMNH_PBI 00101244–AMNH_PBI 00101250) (AMNH). 2.4 mi S of Route 4 on Kanosh road, 38.57024°N 112.45055°W, 2181 m, 16 Jul 1980, R.T. Schuh and G.M. Stonedahl, 2♀ (AMNH_PBI 00102682, AMNH_PBI 00102685) (AMNH); *Juniperus* sp. (Cupressaceae), 1♂ (AMNH_PBI 00102336); *Artemisia tridentata* (Asteraceae), 2♀ (AMNH_PBI 00102683, AMNH_PBI 00102684), 1♂ (AMNH_PBI 00102681). 4.3 mi W of Sevier on route I-70, 38.57508°N 112.3369°W, 1768 m, 16 Jul 1980, G.M. Stonedahl, 1♂ (AMNH_PBI 00101234) (AMNH). Richfield, 38.7725°N 112.08333°W, 15 Jul 1930, collector unknown, light trap, 1♂ (AMNH_PBI 00105585) (TAMU). **Washington:** ***Whitman Co.:*** Pullman, 46.73139°N 117.17861°W, 12 Jul 1898, C.V. Piper, 1♂ (AMNH_PBI 00107232) (USNM). ***Yakima Co.:*** Yakima, 46.60222°N 120.50472°W, 15 Jun 1932, A.R. Rolfs, 1♂ (AMNH_PBI 00105058) (CNC). **Wyoming:** ***Lincoln Co.:*** 15 mi S of Afton on Rt 89, Salt River Pass, 42.53796°N 110.89225°W, 2326 m, 21 Jul 1981, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 2♂ (AMNH_PBI 00102334, AMNH_PBI 00102687), 1♀ (AMNH_PBI 00102688) (AMNH). Salt River Pass, 15 mi S of Afton on Rt 89, 42.54234°N 110.89431°W, 2326 m, 21 Jul 1981, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102763) (AMNH).

OTHER SPECIMENS EXAMINED: **USA: California:** ***San Diego Co.:*** San Diego County, 32.71528°N 117.15639°W, 24 May 1913, E.P. Van Duzee, 1♂ (AMNH_PBI 00077859) (CAS); 08 May 1913, E P. Van Duzee, 3♂ (*A. rubrum* are the bottom specimens, two per pin) (AMNH_PBI 00077860, AMNH_PBI 00077867, AMNH_PBI 00077868) (CAS); 1♂ (two specimens on pin, *A. rubrum* male only) (AMNH_PBI 00107231) (USNM); 19 Jun 1913, E.P. Van Duzee, 1♂, 1♀ (on same pin) (AMNH_PBI 00077856) (CAS). Smuggler's Wash, T14S R6E S11, 32.96800°N 116.32830°W, 510 m, 2♂ (AMNH_PBI 00083279, AMNH_PBI 00083280) (UCR). ***San Luis Obispo Co.:*** SW of San Luis Obispo, Arroyo Grande Creek, 35.11644°N 120.58609°W, 160 m, 08 May 1985, R.T. Schuh and B.M. Massie, *Salvia mellifera* (Lamiaceae), 1♂ (AMNH_PBI 00102686) (AMNH). ***Ventura Co.:*** 6 mi W of Big Oak Flat, 34.57384°N 118.79765°W, 11 May 1997, W.F. Chamberlain, *Cytisus scoparius* (Fabaceae), 1♀ (AMNH_PBI 00105583) (TAMU). **Colorado:** ***Boulder Co.:*** Boulder, 40.015°N 105.27°W, 1676 m, 21 Jul 1903, E.P. Van Duzee, 2♂ (AMNH_PBI 00077891, AMNH_PBI 00077892) (CAS). **Utah:** ***Millard Co.:*** Oak Creek Forest Camp, Fish Lake National Forest, 39.34936°N 112.26637°W, 11 Jul 1993, W.F. Chamberlain, light trap, 1♀ (AMNH_PBI 00105584) (TAMU).

Aoplonemella, gen. nov.

Type species: *Hadronema festiva* Van Duzee, 1910.

DIAGNOSIS: Recognized by the strongly rounded frons and convex vertex (fig. 15A); the metathoracic scent-gland evaporatory area and peritreme absent (fig. 15B); the single vesical spicule without apical processes (fig. 17); the clam-shaped sclerotized rings of the dorsal labiate plate (fig. 18); the relatively long tarsi (fig. 15F); and the vestiture composed of simple semidecumbent setae (fig. 15D).

Aoplonemella may be confused with *Aoplonema* due to the head structure and lack of fore femoral modifications in males, but it is easily separated by the presence of a single unornamented spicule without prolongations or rami, and by the vestiture consisting of simple semierect setae. From all of the other genera of the *Hadronema* group, *Aoplonemella* is easily identified by the distinctive coloration, relatively small size, and structure of male and female genitalia.

DESCRIPTION: *Male:* Small, robust, total length 2.53–3.52. COLORATION: Overall black coloration with orange and pale markings on hemelytra (fig. 1). SURFACE AND VESTITURE: Surface dull, beset with dense macrotrichia; vestiture composed of sparse, long, simple semierect setae (fig. 15D). STRUCTURE: HEAD (fig. 15A): Transverse, nearly rounded in lateral view, not strongly declivent; clypeus weakly protruding basally, barely visible from above, two lateral longitudinal and one small basal area of shiny

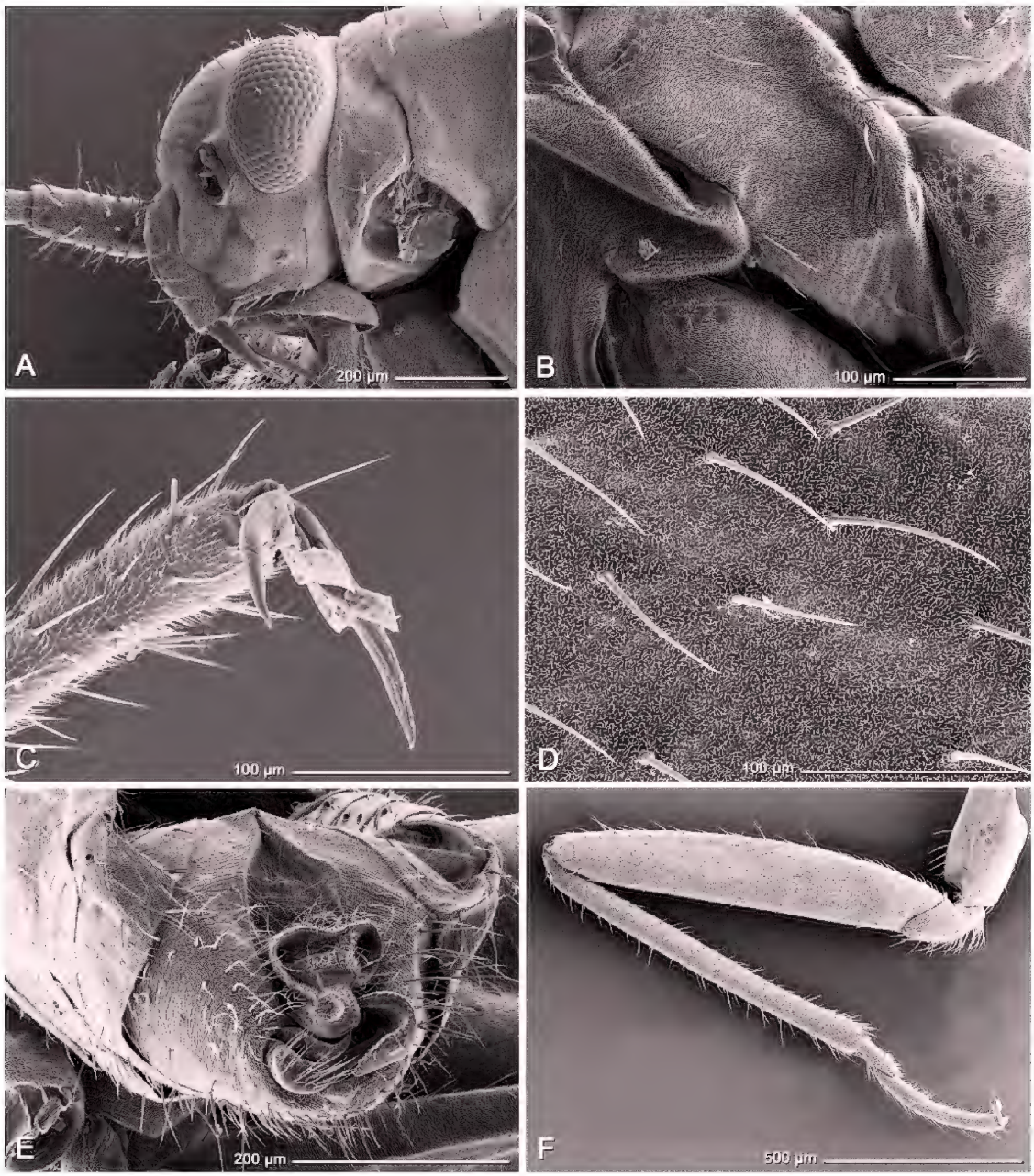

Fig. 15. *Aoplonemella festiva*. **A**. Head, lateral view. **B**. Mesepimeron and metepisternum. **C**. Pretarsus. **D**. Vestiture on hemelytron. **E**. Genital capsule in posterior view. **F**. Foreleg, male.

irregular spots; frons extremely convex, nearly hemispherical, two lateral areas of oblique shiny lines; vertex weakly convex, paired rounded shiny areas next to eyes in front of ocular carina; frons and vertex with scattered short simple setae; transverse carina distinct but not strongly elevated, with a row of simple short suberect setae; mandibular and maxillary plates occupying nearly half the height of head, apex broadly rounded; buccula narrow, neither enlarged nor laterally produced; gena with a few rather long simple

setae; gula very small, almost concealed; eyes small, ovoid in lateral view, hemispherical in dorsal view, barely reaching dorsal margin of head; labrum narrow, acute, about as long as buccula; labium barely surpassing procoxa, not reaching mesocoxa, uniformly setose, segments I–II dull, III–IV shiny; antennal segments nearly of equal diameter, segment I weakly wider than II, I shorter than II, II and III subequal in length, IV the shortest. THORAX: Collar narrow, flat; pronotum trapezoidal, weakly inclined, anterior margin weakly emarginate, posterior margin straight, lateral margins straight and gently rounded laterally, not marginate, anterior angles rounded, posterior angles oblique, broadly rounded; calli flat, nearly not distinct, with irregular shiny spots; mesoscutum usually covered by posterior margin of pronotum; scutellum triangular, nearly equilateral, disc weakly convex, nearly flat; pleural area with a few scattered simple setae; proepisternum not projected laterally; metepisternum covered with dense very short macrotrichia; metathoracic scent-gland evaporatory area and peritreme absent (fig. 15B); prosternum glabrous. *Hemelytra:* Lateral margins gently curved; clavus barely elevated with respect to corium; corium gently deflexed laterally from medial fracture; cuneus weakly deflexed laterally; membrane half as long as hemelytron. *Legs:* Coxae elongate, with short simple setae, more dense on anterior surface; trochanters ovoid, with simple setae as long as trochanter width, longer on mesotrochanter; femora of subequal length, nearly cylindrical, weakly compressed anteroposteriorly, gently narrowing apically (fig. 15F), metafemur barely longer than pro- and mesofemur, profemur with sparse short setae, meso- and metafemur on basal half with dense simple erect setae, nearly as long as femoral width; tibiae straight, cylindrical, nearly as long as femora (fig. 15F), metatibia barely longer than metafemur; tarsi narrow, long, about half as long as tibiae, first tarsomere the shortest, second longer than first, third about as long as first and second together; pretarsus as in figure 15C. ABDOMEN: Beset with sparse very short and delicate simple setae. GENITALIA: Genital capsule subtriangular, about as long as wide (figs. 15E, 16); aperture inclined, small, narrow, anterior margin not well sclerotized (fig. 16); ventrolateral right side of genital capsule with a small blunt projection (fig. 16); proctiger barely reaching apex of genital capsule (fig. 15E); supragenital bridge well sclerotized, thick, located above insertions of parameres (fig. 16); cuplike sclerite not projecting beyond apex of the genital capsule, left and right portions about the same length and height, bases not projected cephalad beyond supragenital bridge (fig. 16); insertion of right paramere weakly above left (figs. 15E, 16); left paramere sickle-shaped, body elongate, apicoventral process acute (fig. 16); right paramere hatchet-shaped in medial view, body elongated, apex flattened and nearly capitate, broadly rounded, medial surface covered with numerous small denticles, tubercle on dorsal angle directed medially, broad and rounded (fig. 16); phallotheca nearly cylindrical, without any protuberances, well sclerotized dorsally, weakly so proximoventrally, distoventrally well sclerotized forming a small convex area (fig. 17), opening small, nearly vertical and circular, weakly turned left; vesica composed of a single flattened spicule, located just before middle of sclerotized part of ductus seminis, spicule usually narrow, subparallel or weakly curved, apex varying from nearly rounded to acute or nearly truncate, relative length varying from shorter than sclerotized part of ductus seminis to about the same length (fig. 17); sclerotized part of ductus seminis long, nearly reaching apex of phallotheca.

Female: Similar to male, weakly ovoid, total length 2.55–3.88. COLORATION: Similar to male (fig. 1). SURFACE AND VESTITURE: Legs with shorter and less dense setae as in male. STRUCTURE: THORAX: *Legs:* Femora with short and sparse setae. ABDOMEN: Sternites with dense medium-sized setae. GENITALIA (fig. 18): Subgenital plate as long as wide, gently converging apically, apex rounded, reaching middle of sternite VIII; base of ovipositor located nearly at longitudinal midpoint of abdomen; interramal sclerites oblong, narrow, close to dorsal margin of posterior wall; dorsal lobes of interramal sclerites very small, rounded, nearly not pedunculate and close to sigmoid process, sparse microtrichia on surface; sigmoid process covered with acute micro-

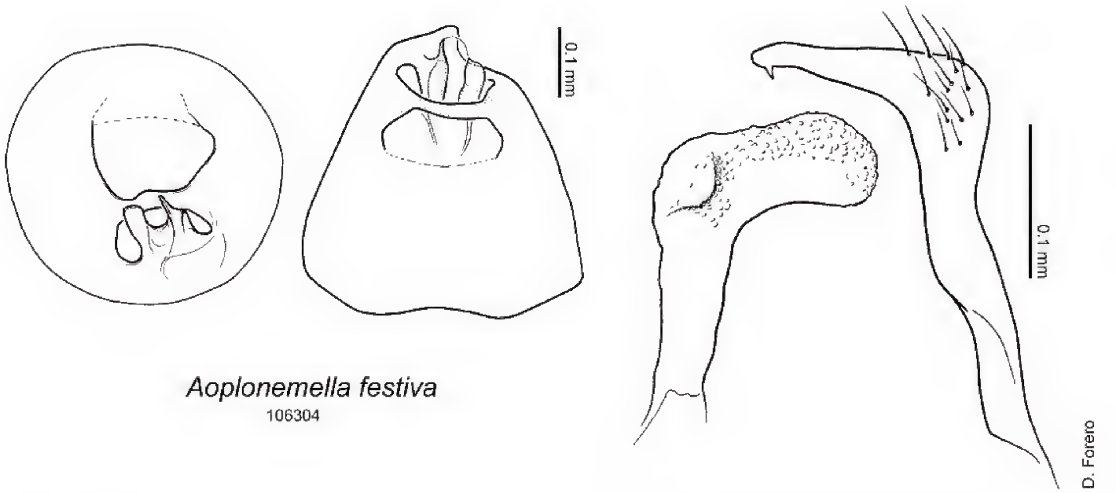

Fig. 16. *Aoplonemella festiva.* Male genitalia: genital capsule, posterior and dorsal views; right and left parameres, dorsomedial and dorsal views, respectively.

trichia; medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized modified structures; sclerotized rings heavily sclerotized, lateral margins wide, forming a nearly concave surface each, anteromedial and posterior margin not sclerotized, overall shape clamlike, lateral accessory sclerite not present; internal surface of seminal depository between lateral margins of sclerotized rings covered with small microtrichia; ventral labiate plate and anterior wall membranous; inner margin of first gonapophyses symmetrical.

DISTRIBUTION: Known from southwestern USA and northern Mexico (fig. 19).

HOST ASSOCIATIONS: *Aoplonemella* seems to be associated with species of Asteraceae, although most of the specimens studied lack host-plant data.

ETYMOLOGY: The generic name is formed from the combination of the generic name "*Aoplonema*" and the Latin diminutive suffix "-ella", due to the resemblance with *Aoplonema* and the relative small size of the type species of the genus. The gender is feminine.

DISCUSSION: *Aoplonemella festiva* exhibits a relatively derived morphology, in particular the male and female genitalia, in respect to the other members of the *Hadronema* group. The vesica is simple and not ornamented with spines (fig. 17), the females have the dorsal lobe of interramal sclerite broadly rounded (fig. 18), and the sclerotized rings are clam-shaped (fig. 18, small arrow). However, other morphological characters such as the structure of the parameres (fig. 16) and the simple vestiture relate this genus with other genera of the group.

Aoplonemella festiva (Van Duzee), **new combination**
Figures 1, 15–19

Hadronema festiva Van Duzee, 1910: 80 [n. sp.].
Hadronema (*Aoplonema*) *festiva:* Knight, 1928: 177 [subgeneric placement]; Carvalho, 1958: 68 [catalog].
Hadronema festivum: Steyskal, 1973: 207 [emendation].
Hadronema (*Aoplonema*) *festivum:* Henry and Wheeler, 1988: 410 [catalog].
Aoplonema festivum: Kerzhner and Schuh, 1995: 4 [new status]; Schuh, 1995: 81 [catalog].

DIAGNOSIS: See generic diagnosis.

REDESCRIPTION: *Male:* Small, robust, total length 2.53–3.52. COLORATION (fig. 1): HEAD: Black; area on vertex next to eyes downward to antennal sockets brownish gray; small medial V-shaped area contiguous with transverse carina whitish; mandibular and maxillary plates brownish gray, maxillary plate darkened apically; line connecting bases of mandibular and maxillary plates with antennal socket black; gena brownish black; eyes black; labrum dark brown;

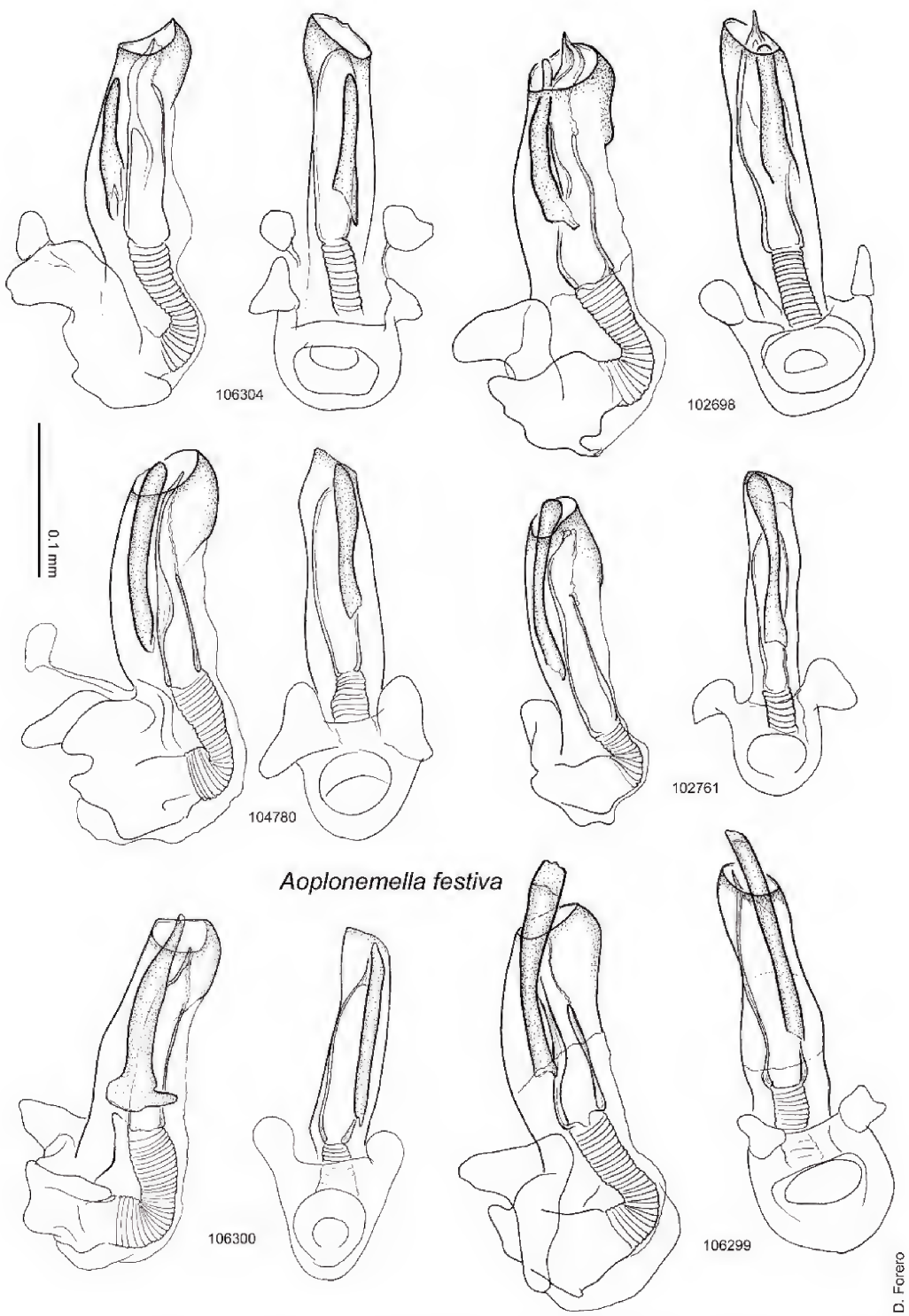

Fig. 17. *Aoplonemella festiva*. Male genitalia: phallus and vesica showing variation across geographic range, lateral left and dorsal views.

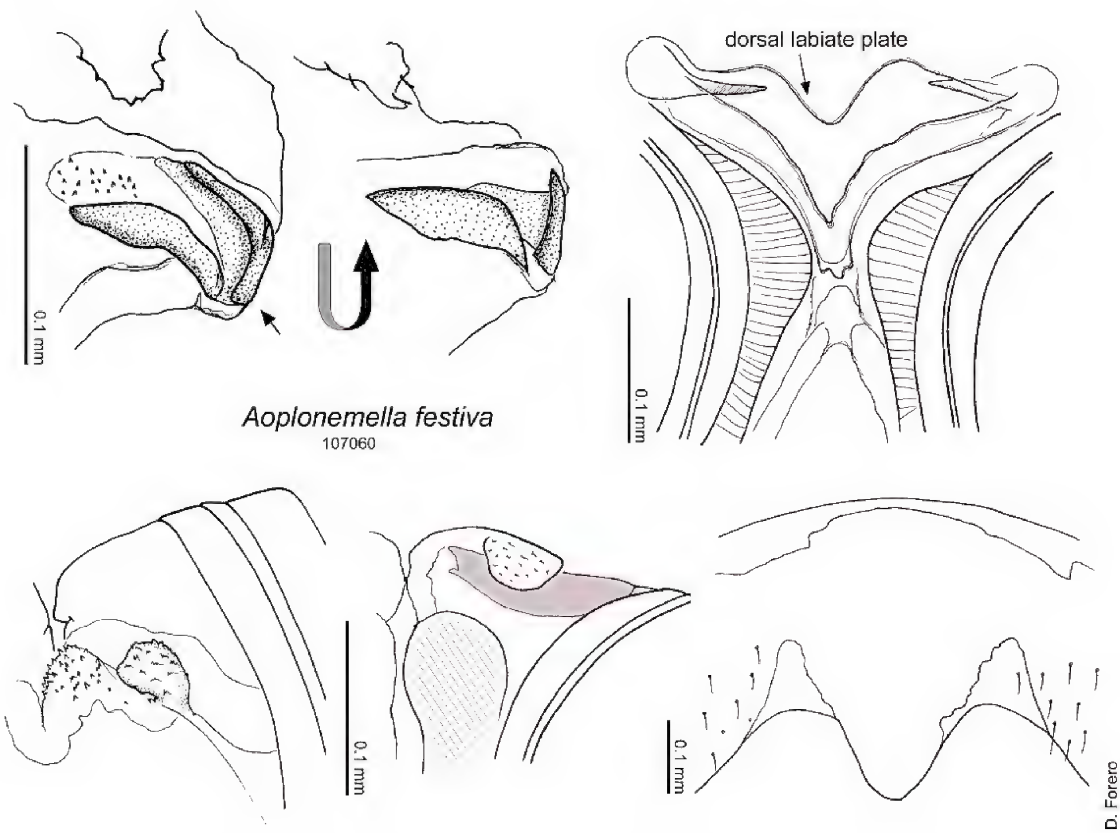

Fig. 18. *Aoplonemella festiva*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal and posterior views; anterior wall, posterior view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic. Small arrow points to the clam-shaped sclerotized dorsal ring.

labium dark brown, segments I–II usually pale dorsally, III–IV shiny; antennae black. THORAX: Collar grayish brown; pronotum dark brown, sometimes posterior lobe grayish with brown spots at base of setae; calli black with irregular shiny spots, narrow gray transversal band behind, sometimes a small whitish spot between calli; mesoscutum and scutellum black, sometimes the latter apically pale; proepisternum dark brown, base of procoxal suture black; proepimeron dark brown, paler on ventral margin; mesepisternum and mesepimeron dark brown, suture black, mesothoracic spiracle black; metepisternum dark brown; venter black. *Hemelytra:* Clavus brown to pale brown; corium orange to pale orange, sometimes area next to claval suture or more extensively pale gray, dark brown circular spot on posterior margin next to membrane; cuneus orange, sometimes inner margin pale; membrane brown, veins dark brown. *Legs:* Dark brown, nearly black. ABDOMEN: Sternites dark brown, posterior margin with a narrow weakly pale band. GENITALIA: Genital capsule black, proctiger and parameres dark brown.

Female (fig. 1): Similar to male in coloration and structure, total length 2.55–3.88.

DISTRIBUTION: *Aoplonemella festiva* is found from the southwestern United States through the Sierra Madre Oriental and the Transverse Volcanic Axis in Mexico (fig. 19).

HOSTS: Most of the specimens lack host-plant information. The only recorded host is *Thymophylla acerosa* (Asteraceae), in addition to a single specimen that was found on *Gutierrezia sarothrae*, also in the Asteraceae. Future fieldwork should focus on securing accurate host information for this taxon.

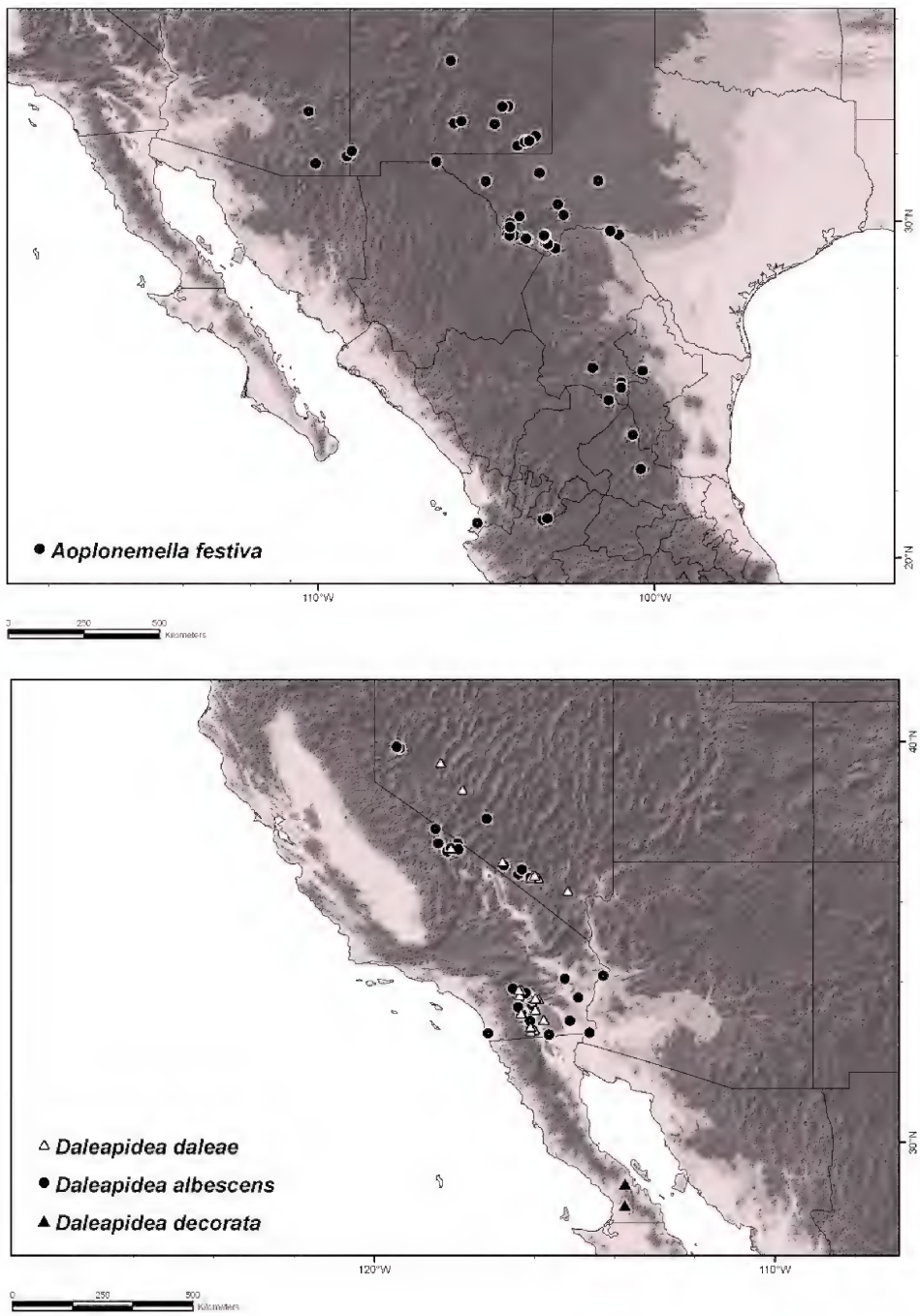

Fig. 19. Distribution maps for *Aoplonemella festiva*, *Daleapidea daleae*, *D. albescens*, and *D. decorata*.

DISCUSSION: *Aoplonemella festiva* shows great variation in certain morphological characters such as total body length (table 1; fig. 1), relative length of antennal segment II (table 1), hemelytral coloration (fig. 1), and vesical morphology (fig. 17). Within the same series small and large specimens may be found (e.g., females of fig. 1). Total body length forms a continuum among specimens. Specimens from Nayarit (on the Pacific coast

of Mexico) are small, but specimens from Zacatecas are almost intermediate in size between those and ones taken at Alamogordo (New Mexico, USA). Similarly, hemelytral coloration varies from bright orange to almost gray (fig. 1). The vesical structure varies with respect to its apical shape and the total relative length (fig. 17). The observed variation could not be correlated with other morphological characters, collecting time, or geographical distribution to form discrete groups. Because it is not clear if these differences are due to host-plant effects (e.g., Carrol and Boyd, 1992; Amarillo-Suárez and Fox, 2006), this issue should be explored with extensive fieldwork and accurate host-plant data to better understand the variability of this widely distributed taxon.

Intraspecific morphological variation has been acknowledged for other Miridae species. Schuh (1974) documented variation of some ratio measurements for *Zanchiella ericae*, a South African Orthotylini; Polhemus and Polhemus (1984) pointed out the variability in paramere structure within *Ephedrodoma multilineata* (Orthotylinae: Orthotylini); Schuh and Schwartz (1988) recognized intraspecific variation in *Pilophorus tibialis* (Phylinae: Pilophorini), including vesica structure; and Schuh (2004) discussed the variability of *Europiella decolor* (Phylinae: Phylini).

Van Duzee (1910) described *Hadronema festiva* from numerous specimens without designating a holotype, all of which were from the Academy of Natural Sciences, Philadelphia. Because many specimens from the syntype series are now deposited in different collections (see below), the designated lectotype is deposited in the ANSP to be consistent with Van Duzee's original description.

LECTOTYPE MALE (here designated): **USA: New Mexico:** ***Otero Co.:*** Alamogordo, [32.89944°N 105.96°W], 23 Apr 1902, [unknown collector], Type No. 5034, "*Hadronema festiva* n. sp." det. E.P. Van Duzee, Lectotype *Hadronema festiva* desig. by D. Forero, 1♂ (AMNH_PBI 00192804) (ANSP).

PARALECTOTYPES (here designated): **USA: New Mexico:** ***Otero Co.:*** Alamogordo, 32.89944°N 105.96°W, 23 Apr 1902–29 Apr 1902, [unknown collector], Cornell U. Lot 461 Sub 13, Paratype Cornell U. No. 3995, 3♀ (AMNH_PBI 00125477–AMNH_PBI 00125479) (CUIC); 23 Apr 1902, [unknown collector], 1♂ (AMNH_PBI 00192806), 3♀ (AMNH_PBI 00192809–AMNH_PBI 00192811) (ANSP), 1♂ (AMNH_PBI 00077849), 2♀ (AMNH_PBI 00077852, AMNH_PBI 00077853) (CAS), 3♀ (AMNH_PBI 00107060–AMNH_PBI 00107062) (USNM); 07 Jun 1902, [unknown collector], 2♀ (AMNH_PBI 00192813, AMNH_PBI 00192814) (ANSP), 1♀ (AMNH_PBI 00107063) (USNM); 30 Apr 1902, [unknown collector], 2♂ (AMNH_PBI 00192805, AMNH_PBI 00192807), 1♀ (AMNH_PBI 00192812) (ANSP); 07 May 1902, [unknown collector], 1♂ (AMNH_PBI 00192808) (ANSP), 1♀ (AMNH_PBI 00077854), "Allotype *festiva*", Type No. 2078, 1♀ (AMNH_PBI 00077848) (CAS); 29 Apr 1902, [unknown collector], 1♂ (AMNH_PBI 00077850), 1♀ (AMNH_PBI 00077851) (CAS).

OTHER SPECIMENS EXAMINED: **MEXICO: Coahuila:** 15 mi S Saltillo, 25.19876°N 101°W, 08 Jul 1983, Kovarik, Harrison, and Schaffner, 1♀ (AMNH_PBI 00106278) (TAMU). 18 mi E Paila, 25.63305°N 101.8433°W, 11 Jul 1959, R. B. Selander and J.C. Schaffner, 1♀ (AMNH_PBI 00106280) (TAMU). 26 mi S of Saltillo, 25.03896°N 101°W, 08 Jul 1983, Kovarik, Harrison, and Schaffner, 1♀ (AMNH_PBI 00106158) (TAMU). **Nayarit:** Rincon de Guayabitos, 21.01667°N 105.26666°W, 78 m, 07 Dec 1977, R. Zurbia, 1♀ (AMNH_PBI 00107049) (USNM). **Nuevo Leon:** Huasteca Canyon, nr. Monterrey, 25.55°N 100.3667°W, 11 Jul 1963, H.F. Howden, 2♂ (AMNH_PBI 00104783, AMNH_PBI 00104784), 10♀ (AMNH_PBI 00104785–AMNH_PBI 00104794) (CNC). **San Luis Potosi:** 19.6 mi S of Huizache, 22.63331°N 100.41666°W, 25 Jul 1976, Schaffner et al., 5♀ (AMNH_PBI 00106268–AMNH_PBI 00106272) (TAMU). El Refugio, 02 Sep 1958, H.F. Howden, 1♀ (AMNH_PBI 00105059) (CNC). Matehuala, 23.65°N 100.65°W, 07 Sep 1969, L.A. Kelton, 5♂ (AMNH_PBI 00104776–AMNH_PBI 00104780), 2♀ (AMNH_PBI 00104781, AMNH_PBI 00104782) (CNC). **Zacatecas:** 13 mi SW of Concepcion del Oro, 21.1171°N 103.32579°W, 09 Jul 1983, Kovarik, Harrison, and Schaffner, 1♀ (AMNH_PBI 00106279) (TAMU). 4 mi NE of Concepcion del Oro, 24.67442°N 101.37145°W, 04 Jul 1984, J.B. Woolley, 2♀

(AMNH_PBI 00106276, AMNH_PBI 00106277) (TAMU). 6 mi S of Concepcion del Oro, 21.16325°N 103.18333°W, 09 Jul 1983, Kovarik, Harrison, and Schaffner, 3♀ (AMNH_PBI 00105608, AMNH_PBI 00106156, AMNH_PBI 00106157) (TAMU). **USA: Arizona:** ***Cochise Co.:*** 10 mi S of Benson, on Route 90, 31.92543°N 110.20431°W, 12 Apr 1989, T.J. Henry and A.G. Wheeler, Jr., 2♂ (AMNH_PBI 00133927, AMNH_PBI 00133928), 2♀ (AMNH_PBI 00133929, AMNH_PBI 00133930) (USNM). Tombstone, 31.71278°N 110.06694°W, 1372 m, 02 Jun 1926, A.A. Nichol, 1♀ (AMNH_PBI 00104799) (CNC), 1♀ (AMNH_PBI 00106254) (TAMU), 1♂ (AMNH_PBI 00107038), 7♀ (AMNH_PBI 00107050–AMNH_PBI 00107056) (USNM). Vicinity of Portal, 31.91361°N 109.14083°W, 1600 m, 02 May 1978–07 May 1978, R.T. Schuh, 1 adult sex unknown (AMNH_PBI 00102160), *Thymophylla acerosa* (Asteraceae), 31♂ (AMNH_PBI 00102096–AMNH_PBI 00102125, AMNH_PBI 00102761), 33♀ (AMNH_PBI 00102128–AMNH_PBI 00102159, AMNH_PBI 00102760) (AMNH). ***Graham Co.:*** 36 mi SE of Globe on I-70, 33.25239°N 110.28234°W, 853 m, 28 Jun 1981, D.A. and J.T. Polhemus, 1♀ (AMNH_PBI 00065072) (JTP). **New Mexico:** ***Chaves Co.:*** 10 mi E of Roswell, 33.39913°N 104.34623°W, 02 Aug 1975, W.F. Chamberlain, 3♀ (AMNH_PBI 00106255–AMNH_PBI 00106257) (TAMU). Roswell, 33.39417°N 104.5225°W, 02 Oct 1971, G.B. Marshall, *Gutierrezia sarothrae* (Pursh) Britt. and Rusby (Asteraceae), 1♀ (AMNH_PBI 00107058) (USNM). ***Eddy Co.:*** Malaga, 32.22388°N 104.07222°W, 02 Jun 1959, Howden and Becker, 2♂ (AMNH_PBI 00104795, AMNH_PBI 00104796), 5♀ (AMNH_PBI 00104800–AMNH_PBI 00104804) (CNC). Site 5, 32.38333°N 103.85111°W, 25 Sep 1979, R.R. Murray and J.C. Schaffner, 1♂ (AMNH_PBI 00106162) (TAMU). Site 6, 32.35°N 103.85°W, 25 Sep 1979, R.R. Murray and J.C. Schaffner, 2♀ (AMNH_PBI 00106228, AMNH_PBI 00106229) (TAMU). Site 7, Eddy County, 32.875°N 104.75°W, 15 Aug 1979, Delorme, McHugh, Burke, Schaffner, 1♂ (AMNH_PBI 00106161) (TAMU). ***Hidalgo Co.:*** 2 mi S of Granite Gap, 32.071°N 108.995°W, 14 Aug 1974, M. and M.T. Favreau, 1♀ (AMNH_PBI 00102126) (AMNH). ***Lea Co.:*** Site 12, 32.52222°N 103.53278°W, 24 Sep 1979, R.R. Murray and J.C. Schaffner, 1♂ (AMNH_PBI 00106163) (TAMU); 16 Aug 1979, J.C. Schaffner, 1♂ (AMNH_PBI 00106164), 1♀ (AMNH_PBI 00106233) (TAMU); 25 Jun 1979, D.R. Delorme and H.L. Carrola, 2♀ (AMNH_PBI 00106231, AMNH_PBI 00106232) (TAMU). Site 14, 32.38°N 103.72166°W, 23 Sep 1979, R.R. Murray and J.C. Schaffner, 1♂ (AMNH_PBI 00106304), 1♀ (AMNH_PBI 00106230) (TAMU). ***Otero Co.:*** Alamogordo, 32.89944°N 105.96°W, 26 Jun 1940, D.E. Hardy, 3♀ (AMNH_PBI 00075247, AMNH_PBI 00075250, AMNH_PBI 00075251) (KU). Cloudcroft, 32.95731°N 105.7424°W, 2642 m, 27 Jun 1940, D.E. Hardy, 1♀ (AMNH_PBI 00075252) (KU). ***Torrance Co.:*** Estancia, 34.75833°N 106.05528°W, 21 Apr 1924, C.H. Hicks, 2♀ (AMNH_PBI 00107057, AMNH_PBI 00107059) (USNM). **Texas:** ***Brewster Co.:*** Big Bend National Park, 29.56527°N 103.26055°W, 23 Sep 1950, J.C. Elkins, 1♀ (AMNH_PBI 00102127) (AMNH). Big Bend National Park, Boquillas, 29.18508°N 102.94928°W, 564 m, 17 May 1959, W.R. Mason, 1♂ (AMNH_PBI 00104797) (CNC); 23 May 1959, Howden and Becker, 1♀ (AMNH_PBI 00104805) (CNC). Big Bend National Park, Government Spring, 29.33846°N 103.2578°W, 05 Jul 1986, J. Heraty, 1♀ (AMNH_PBI 00106258) (TAMU). Big Bend National Park, K-Bar Ranch, 29.30726°N 103.18025°W, 1000 m, 05 Sep 1988–07 Sep 1988, R. Anderson, 1♂ (AMNH_PBI 00106242), 10♀ (AMNH_PBI 00106248–AMNH_PBI 00106250, AMNH_PBI 00106261–AMNH_PBI 00106267) (TAMU). Big Bend National Park, Rosillos Mountains, 29.57583°N 103.26111°W, 05 Aug 1991, J.C. Schaffner, 1♂ (AMNH_PBI 00106168), 2♀ (AMNH_PBI 00106186, AMNH_PBI 00106206); *Thymophylla acerosa* DC. (Asteraceae), det. A.M. Powell 1991, 3♂ (AMNH_PBI 00106273–AMNH_PBI 00106275), 3♀ (AMNH_PBI 00106281–AMNH_PBI 00106283) (TAMU). Big Bend National Park, Rosillos Mountains, Alamo Spring area, 29.5213°N 103.2879°W, 05 Aug 1991, J.C. Schaffner, 13♂ (AMNH_PBI 00106170–AMNH_PBI 00106181, AMNH_PBI 00106298), 12♀ (AMNH_PBI 00106183–AMNH_PBI 00106185, AMNH_PBI 00106187–AMNH_PBI 00106195) (TAMU). Big Bend National Park, Rosillos Mountains, Buttrill Spring, 29.55852°N 103.2921°W, 23 Apr 1991, J.C. Schaffner, 1♂ (AMNH_PBI 00106169) (TAMU); 10 Jul

1991–19 Jul 1991, R. Vogtsberger, 1♀ (AMNH_PBI 00106259) (TAMU). Big Bend Ranch State Natural Area, Tres Papalotes, 29.45667°N 103.77556°W, 01 Nov 1989, G. Zolnerowich, 1♀ (AMNH_PBI 00106260) (TAMU). ***El Paso Co.:*** El Paso, 31.75861°N 106.48639°W, 23 Aug 1948, collector unknown, 10♀ (AMNH_PBI 00107039–AMNH_PBI 00107048) (USNM); 20 Jun 1909, F.C. Bishop, 1♂ (AMNH_PBI 00104798) (CNC). ***Hudspeth Co.:*** 20 mi E of Sierra Blanca, 31.174°N 105.01737°W, 14 Sep 1965, D. Smith, 1♀ (AMNH_PBI 00083486) (UCR). ***Pecos Co.:*** 20 mi W of Sanderson, 30.17344°N 102.70864°W, 12 Sep 1965, Timberlake, 1♀ (AMNH_PBI 00083488) (UCR). 28 mi S of Fort Stockton, 30.4891°N 102.87889°W, 18 Apr 1985, J.C. Schaffner, 1♀ (AMNH_PBI 00106252) (TAMU). ***Presidio Co.:*** 12 mi E of Presidio, 29.56041°N 104.17137°W, 04 Jun 1968, M.L. Allender, 1♂ (AMNH_PBI 00106299) (TAMU). 12 mi S of Marfa, 30.13357°N 104.01861°W, 29 Sep 1966, C.L. Cole, 1♂ (AMNH_PBI00106182), 9♀ (AMNH_PBI 00106196–AMNH_PBI 00106199, AMNH_PBI 00106212–AMNH_PBI 00106216) (TAMU). 13 mi N of Presidio, 29.74849°N 104.37167°W, 01 Sep 1966–15 Sep 1966, C.L. Cole, 2♀ (AMNH_PBI 00106204, AMNH_PBI 00106205) (TAMU). 2 mi S of Shafter, 29.79096°N 104.30278°W, 02 Jul 1968, J.E. Hafernik, 1♂ (AMNH_PBI 00106165) (TAMU). 3 mi N Presidio, 29.60412°N 104.37167°W, 12 Sep 1966, C.L. Cole, 1♂ (AMNH_PBI 00106166), 4♀ (AMNH_PBI 00106200–AMNH_PBI 00106203) (TAMU); 01 Sep 1966, C.L. Cole, 1♂ (AMNH_PBI 00065070), 1♀ (AMNH_PBI 00065071) (JTP). 4 mi E Presidio, 29.56054°N 104.3049°W, 17 Aug 1968, J.E. Hafernik, 1♀ (AMNH_PBI 00106211) (TAMU). 5 mi N of Shafter, 29.89259°N 104.30278°W, 1219 m, 30 Apr 1982, D.A. and J.T. Polhemus, 26♂ (AMNH_PBI 00065021–AMNH_PBI 00065046), 23♀ (AMNH_PBI 00065047–AMNH_PBI 00065069) (JTP). 8 mi N of Shafter, 29.93615°N 104.30278°W, 30 Sep 1966, C.L. Cole, 1♂ (AMNH_PBI 00106167), 12♀ (AMNH_PBI 00093861, AMNH_PBI 00106217–AMNH_PBI 00106222, AMNH_PBI 00106234–AMNH_PBI 00106238) (TAMU). Big Bend Ranch St. Nat. Area, 29.5125°N 103.86555°W, 19 Oct 1990, G. Zolnerowich, 1♂ (AMNH_PBI 00106239) (TAMU). Big Bend Ranch St. Nat. Area, McGuirks Tanks, 29.47611°N 103.82°W, 28 Apr 1991, J.C. Schaffner, 1♀ (AMNH_PBI 00106251) (TAMU). Shafter, 29.82°N 104.30278°W, 02 Aug 1968, J.E. Hafernik, 3♀ (AMNH_PBI 00106207–AMNH_PBI 00106209) (TAMU); 20 Jun 1968, J.E. Hafernik, 1♀ (AMNH_PBI 00106210) (TAMU); 08 Aug 1968, M.L. Allender, 5♀ (AMNH_PBI 00106223–AMNH_PBI 00106227) (TAMU). ***Reagan Co.:*** 13 mi W Big Lake, 31.19265°N 101.68112°W, 19 Apr 1985, J.C. Schaffner, 1♂ (AMNH_PBI 00106247) (TAMU). ***Reeves Co.:*** 4 mi E of Pecos, 31.42276°N 103.42474°W, 15 Sep 1965, Timberlake, 1♀ (AMNH_PBI 00083487) (UCR). ***Val Verde Co.:*** 9 mi SE of Comstock, 29.59173°N 101.0667°W, 16 Apr 1985, J.C. Schaffner, 2♂ (AMNH_PBI 00106246, AMNH_PBI 00106300), 1♀ (AMNH_PBI 00106253) (TAMU). Seminole Canyon State Park, 29.7007°N 101.3209°W, 427 m, 15 Apr 1989, J. Heraty, 3♂ (AMNH_PBI 00106243–AMNH_PBI 00106245) (TAMU); J.B. Woolley and G. Zolnerowich, 2♂ (AMNH_PBI 00106240, AMNH_PBI 00106241) (TAMU).

Daleapidea Knight

Type species: *Daleapidea daleae* Knight, 1968 (by original designation).

Daleapidea Knight, 1968: 101 [n. gen.]; Henry and Wheeler, 1988: 407 [catalog]; Schuh, 1989: 159 [revision]; Schuh, 1995: 102 [catalog].

DIAGNOSIS: Recognized by the elongate genital capsule (figs. 20F, 21); the basally enlarged first antennal segments of male (figs. 2, 20A); and the apically enlarged and ventrally flattened front tibiae laterally beset with enlarged setae (fig. 20C).

Daleapidea is easily distinguished from other members of the *Hadronema* group by the enlarged genital capsule and the particular modifications on the fore tibia. Other members of the *Hadronema* group have the genital capsule subquadrangular or subtriangular but never elongate, and the fore tibia is mostly cylindrical and never expanded apically. *Daleapidea* females are difficult to identify without associated males, as they might resemble females of *Origonema*, but coloration alone can help sort them out.

REDESCRIPTION: *Male:* Robust, medium to moderately large species, total length 3.78–

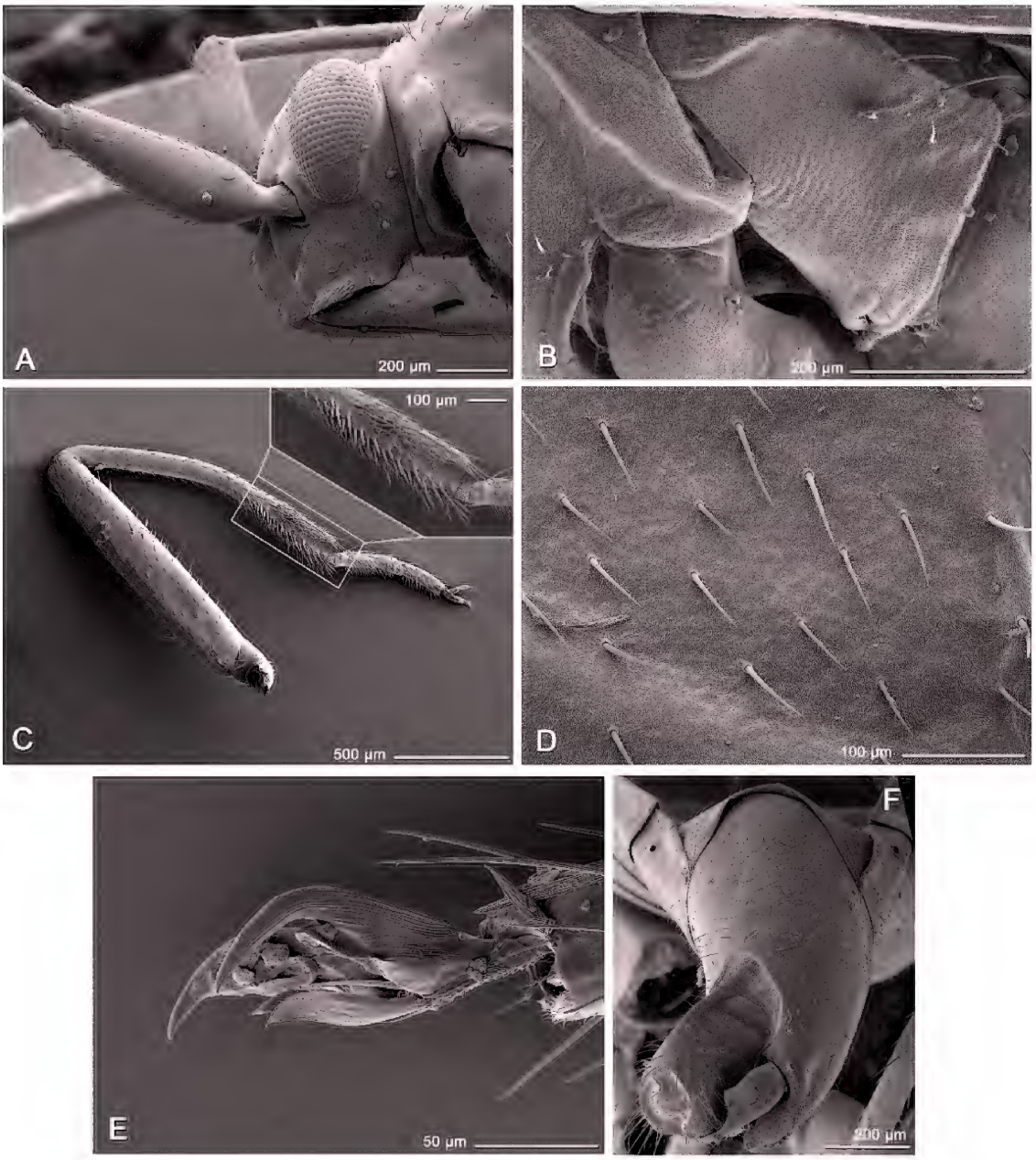

Fig. 20. *Daleapidea daleae*. **A**. Head, lateral view. **B**. Mesepimeron and metepisternum. **C**. Foreleg, with inset of detailed expanded apical tibia, male. **D**. Vestiture on hemelytron. **E**. Pretarsus. **F**. Genital capsule in posterior view.

4.59. COLORATION: Black or dark orange, with gray, orange, and pale markings (fig. 2). SURFACE AND VESTITURE: Surface dull, smooth, beset with microtrichia; simple short or very short decumbent setae on dorsum (fig. 20D). STRUCTURE: HEAD (fig. 20A): Transverse, declivent, ovoid in lateral view, dull or shiny, scattered setae on surface; clypeus protruding basally, almost vertical; frons convex; vertex weakly convex, posterior margin not raised; mandibular and maxillary plates occupying half

of height of head, rounded at apex; gena with scattered short simple setae; gula barely shorter than buccula; buccula sometimes laterally expanded, with short or long setae, dense or not; eyes large, ovate, in dorsal view close to the anterior margin of pronotum; labrum subequal or shorter than buccula, narrow, acute apically; labium almost or reaching mesocoxa, II more densely setose than other segments; antennal segment I enlarged subbasally, at least twice as wide as II, II the longest, sometimes apex flattened, expanded, and covered with dense short setae, III shorter than II, and similar in diameter as II, IV the shortest and smallest in diameter. THORAX: Collar short, flattened; pronotum trapezoidal, weakly convex, not strongly inclined, anterior angles rounded, posterior angles oblique, broadly rounded, calli not distinct, not elevated, with scattered shiny spots, posterior lobe weakly rugose; mesoscutum usually hidden by pronotum; scutellum triangular, nearly equilateral, barely elevated, disc flat or weakly convex with anterior margin weakly concave; pleural area with scattered setae; proepisternum beset with long setae or nearly glabrous, sometimes weakly protruding laterally; metepisternum with macrotrichia, sometimes densely covered; metepisternal scent-gland evaporatory area from present to absent, if present, dorsal margin almost rounded and posteriorly weakly triangular, not reaching level of dorsal portion of metacoxae; peritreme from normally developed to absent (fig. 20B), if present, rounded, weakly protruding; prosternum glabrous. *Hemelytra:* Nearly parallel, weakly sinuate before cuneus, as long as abdomen; clavus weakly elevated respect to corium; corium deflexed laterally from medial fracture; cuneus not deflexed, barely longer than wide; membrane about half as long as hemelytron. *Legs:* Coxae elongate, nearly cylindrical, beset with sparse or dense short setae; trochanters globose, with short, sparse or dense setae; profemur weakly compressed anteroposteriorly, barely greater in diameter basally, about as long as mesofemur, ventral surface with very short setae, sometimes covered with setae as long as width of femur; mesofemur similar to profemur, less enlarged basally; metafemur wider than pro- and mesofemur, enlarged basally, weakly curved posteriorly in dorsal view, sometimes ventrally weakly excavated and curved ventrally but not posteriorly, and beset apically with numerous setae as long as femoral width; protibia cylindrical, wider than mesotibia, distal half weakly curved inward, apex with a ventral flat expanded area laterally covered densely or not with short, enlarged setae, medially weakly excavated (fig. 20C); mesotibia of subequal length as protibia, but narrow, straight; metatibia as thick as mesotibia, longer than pro- and mesotibia; first tarsal segment the shortest, third the longest, sometimes mesotarsus laterally with numerous long delicate setae; pretarsus as in figure 20E. ABDOMEN: Sternites with very short sparse setae, sometimes with denser and longer setae; segments III–VI barely keeled medially, sometimes area flat. GENITALIA: Genital capsule elongated, approximately twice as long as wide; aperture inclined, small and ovate, curved to the left, anterior margin strongly sclerotized; ventrolateral right projection narrow or wide, truncate or rounded; proctiger surpassing apex of genital capsule; cuplike sclerite not surpassing ventrolateral projection, bases delicate, long, not reaching anterior margin of aperture, right and left portions subequal in length, right portion narrow, left one wider, weakly elevated; supragenital bridge thick, heavily sclerotized, located above insertions of parameres; insertion of right paramere weakly above left; left paramere sickle-shaped, apicoventral process blunt or acute, sometimes dorsal medial surface projecting as a long dorsal lobe bearing apically stout setae, and sometimes apex of paramere with a flattened truncate dorsad projection (fig. 21); right paramere hatchet-shaped in medial view, body elongated, small or medium-sized tubercle on dorsal angle projecting medially, apically blunt or acute, apex of paramere broadly rounded with a cephalad projected margin, or more rounded, or narrow; phallotheca almost cylindrical, without any protuberances on surface, well sclerotized on dorsal and ventrodistal surfaces, weakly so on basal third, opening long, ovate elongate, directed to the left, inclined, more than half as long as phallotheca (fig. 21); vesica with two well-sclerotized spicules, left and right, located at base of

sclerotized piece of ductus seminis; left spicule gradually enlarged apically, apically rounded without denticles, with two projections (rami), apical and preapical, directed cephalad, expanded distally, variously denticulate; right spicule about half as long as left one, enlarged basally, constricted at middle, narrowing distally, variously denticulate at apex, strongly or gently curved upward, and weakly directed to the left; sclerotized part of ductus seminis long, about as long as left spicule.

Female: Similar to male, but wider and larger, total length 4.22–4.81. COLORATION: Similar to male (fig. 2). SURFACE AND VESTITURE: As in male. STRUCTURE: HEAD: Scapus not incrassate as in male. THORAX: *Legs:* Fore tibia apically less expanded; mesotarsus without long setae laterally. ABDOMEN: Segments III–VI not keeled. GENITALIA: Subgenital plate short, nearly as long as wide, broadly triangular, apex rounded (fig. 23), reaching middle of segment VIII; base of ovipositor located nearly at longitudinal midpoint of abdomen; interramal sclerites oblong or subquadrangular, edges usually not well defined (fig. 22); dorsal lobes of interramal sclerites ovate or oblong, inner margin sinuate, subbasally enlarged medially and curved inward, outer margin curved gently medially distally, apically acute, covered with small microtrichia mostly arranged homogeneously in a scalelike fashion (fig. 22); sigmoid process and dorsal margin of interramal sclerites covered with microtrichia (fig. 22); medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized modified structures; sclerotized rings subrectangular, external margin laterally recurved, medial posterior margin sometimes produced and weakly sclerotized, lateral small accessory sclerite from almost inconspicuous to acute or enlarged (fig. 22); internal surface of seminal depository anterior to sclerotized rings usually covered with small microtrichia; caudal ventral margin of ventral labiate plate forming a medium-sized ventral protuberance, weakly covering part of the anterior wall in posterior view (fig. 23), sometimes distally weakly sclerotized; inner margin of first gonapophyses symmetrical; anterior wall membranous, without conspicuous folds or sclerotizations.

DISTRIBUTION: Western United States from the Great Basin and Mohave Deserts to the Sierra Nevada, south to Baja California, Mexico, to about 28°N (fig. 19).

HOST ASSOCIATIONS: All *Daleapidea* species are associated with Fabaceae species of the genus *Psorothamnus* (Schuh, 1989). *Daleapidea* was named by Knight (1968) due to its association with "*Dalea*" plants and by the apparent resemblance to *Lopidea*. "*Dalea*" species associated with *Daleapidea* mentioned by Knight are now all segregated in the genus *Psorothamnus* (Barneby, 1977). Old labels mentioning "*Dalea*" as host plants cannot unambiguously be identified and may be any of the segregated genera, or one of the more than 160 described species of *Dalea* (Barneby, 1977, 1990).

DISCUSSION: Schuh (1989) in his revision of *Daleapidea* documented for the first time the distinctive structure present in the fore tibia. This distal flattened area on the ventral surface of the fore tibia has a set of setae on its lateral margins that vary with respect to their density. *Daleapidea albescens* is the only species in which the setae are not densely set.

Schuh (1989: fig. 5L) presented a schematic illustration for the phallotheca of *D. decorata*. This structure was misinterpreted in the provided drawing as being completely open dorsally with overlapping lateral margins. Nevertheless, the phallotheca of the three described species of *Daleapidea* share a particular configuration (fig. 21), similar to the type found in *Aoplonemella* (fig. 17), *Origonema* (fig. 43), and particularly to the form found in *Hadronema* and *Hadronemidea* (figs. 28, 29, 39).

Key to the Species of *Daleapidea*

1. Scutellum mostly orange (fig. 2); second antennal segment in males cylindrical (fig. 2) 2
— Scutellum mostly black, apically pale (fig. 2); distal half of antennal segment II in males expanded (fig. 2) and densely setose . . . . . *D. daleae*
2. Head dorsally and legs black, scutellum bright orange (fig. 2); evaporatory area on metepisternum absent; males with left paramere not produced dorsally . . . *D. decorata*

— Head dorsally and legs pale orange, scutellum pale orange (fig. 2); evaporatory area on metepisternum normally developed; males with left paramere dorsally produced as an elongate sensory lobe, apically beset with strong setae (fig. 21) . . . . . *D. albescens*

Daleapidea albescens (Van Duzee)
Figures 2, 19, 21–23

Hadronema albescens Van Duzee, 1918: 297 [n. sp.].

Hadronema (*Aoplonema*) *albescens:* Knight, 1928: 177 [subgeneric placement, key]; Carvalho, 1958: 68 [catalog].

Daleapidea albescens: Knight, 1968: 102 [new combination]; Henry and Wheeler, 1988: 407 [catalog]; Schuh, 1989:161 [diagnosis, distribution, hosts]; Schuh, 1995: 102 [catalog].

DIAGNOSIS: Recognized by the orange head and mostly orange legs (fig. 2); the laterally expanded buccula covered with long dense hairs; the normally developed evaporatory area and peritreme; and the elongate sensory lobe on the dorsal surface of the left paramere with an expanded dorsal apical process (fig. 21).

Daleapidea albescens is easily distinguished from other *Daleapidea* species by the overall orange coloration, the structure of the evaporatory area, and the structure of male genitalia, in particular of the left paramere. The modified dorsal surface of the left paramere is unique among species of the *Hadronema* group, which usually have a curved dorsal surface without any sensory lobes or prolongations.

REDESCRIPTION: *Male:* Medium size, total length 3.82–4.05. COLORATION: Pale with orange and dark areas (fig. 2). HEAD: Orange; base of head next to eyes with two small dark areas; sometimes mandibular and maxillary plates pale yellow; suture at base of plates connecting antennal socket with eye not pigmented; gena usually paler; eyes dark; labrum basally dark; labium darkened, segment I pale orange, segments III–IV shiny brown; antennae black. THORAX: Collar pale gray; pronotum gray; calli black with shiny areas; mesoscutum orange; scutellum pale orange, brighter toward the margin; proepisternum pale gray with a black spot at base of coxal suture; proepimeron pale gray, sometimes anteriorly more orange with a black spot on coxal suture; mesepisternum black, sometimes suffused with orange; mesepimeron pale gray, sometimes suffused anteriorly with orange; metepisternum black orange, evaporatory area pale, peritreme dark; prosternum whitish; mesosternum dark. *Hemelytra:* Pale gray; clavus and corium with claval suture and medial fracture dark brown with longitudinally arranged dark brown spots, corium with a rounded dark brown marking next to the claval commissure; cuneus whitish; membrane brown, veins dark brown. *Legs:* Procoxa orange, basally black, usually with an anterior and a posterior dark spot; meso- and metacoxa black, apically orange; foreleg trochanters orange, on middle and hindlegs basally pale, apically black; femora orange, apically black, metafemur almost completely black, orange apically; tibiae dark brown; tarsi black. ABDOMEN: Sternites black on dorsal margin, whitish medially, posterior sternites with whitish marking small. GENITALIA: Genital capsule black; proctiger dark brown; parameres brown. STRUCTURE: HEAD: Dull; buccula expanded laterally, beset with long delicate setae; labrum subequal to buccula; labium reaching mesocoxa; apex of antennal segment II cylindrical. THORAX: Disc of scutellum flat; proepisternum with long setae; metepisternum with evaporatory area and peritreme normally developed. *Legs:* Coxae, trochanters, and femora with short setae; metafemur curved posteriorly in dorsal view; protibia with apical expanded area covered laterally with not so dense enlarged setae; mesotarsus without long lateral setae. ABDOMEN: Sternites with short sparse setae; segments III–VI weakly keeled. GENITALIA (fig. 21): Ventrolateral right projection of genital capsule narrow and rounded; left paramere with apicoventral process acute, apically with a dorsal flattened truncate projection, dorsal surface of paramere with a large cylindrical dorsal projection apically beset with stout setae; right paramere apically truncate, dorsal process of medium size, acute; left spicule with rami greatly expanded and denticulate, reaching apex of right spicule; right spicule gently curved upward, tapering towards apex, weakly denticulate apically.

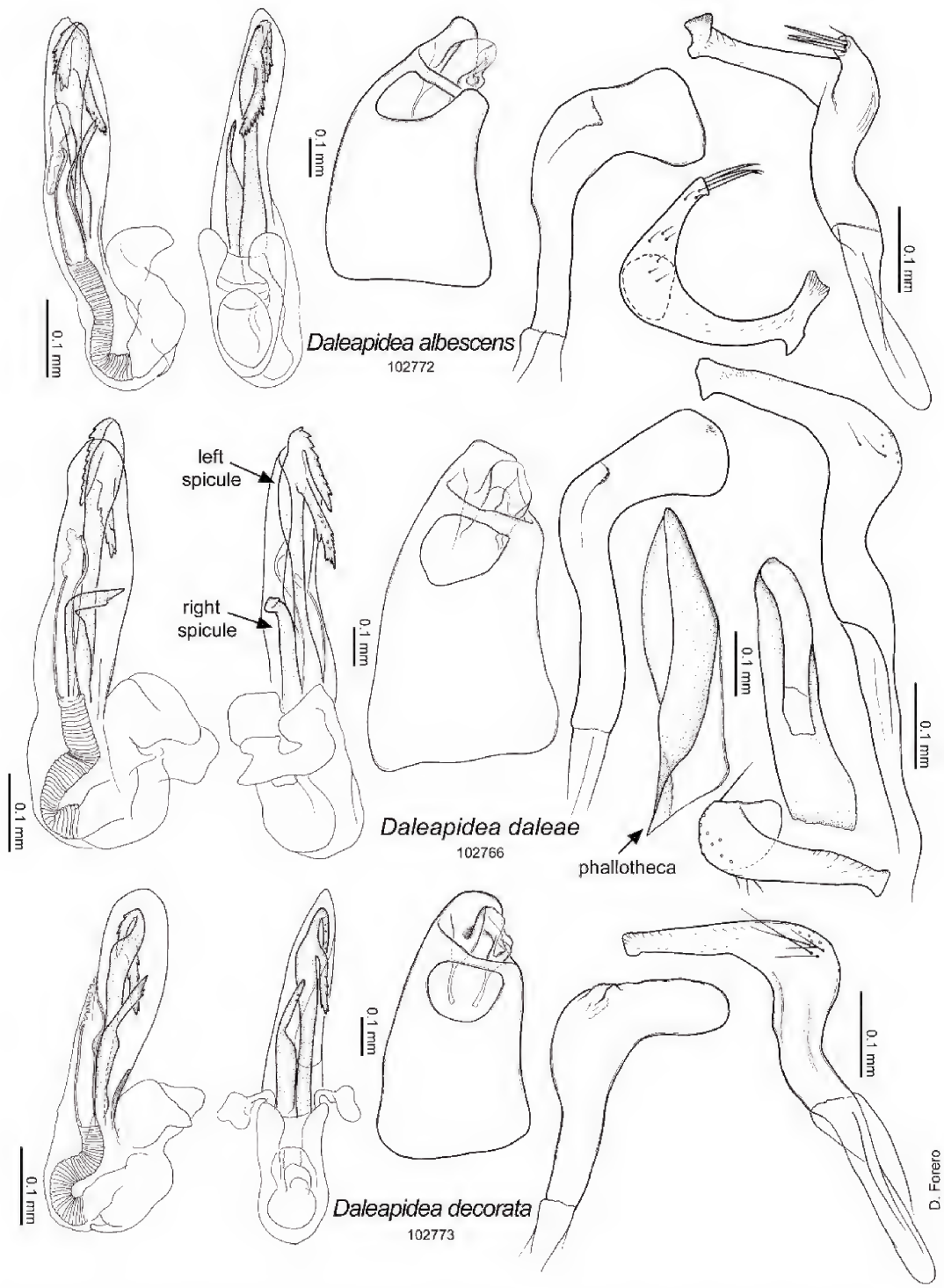

Fig. 21. *Daleapidea albescens*, *D. daleae*, and *D. decorata*. Male genitalia: phallus and vesica, lateral right and dorsal views; genital capsule, dorsal view; right and left paramere, dorsomedial and dorsal views, respectively; posterior view of left paramere; phallotheca, lateral left and dorsal views.

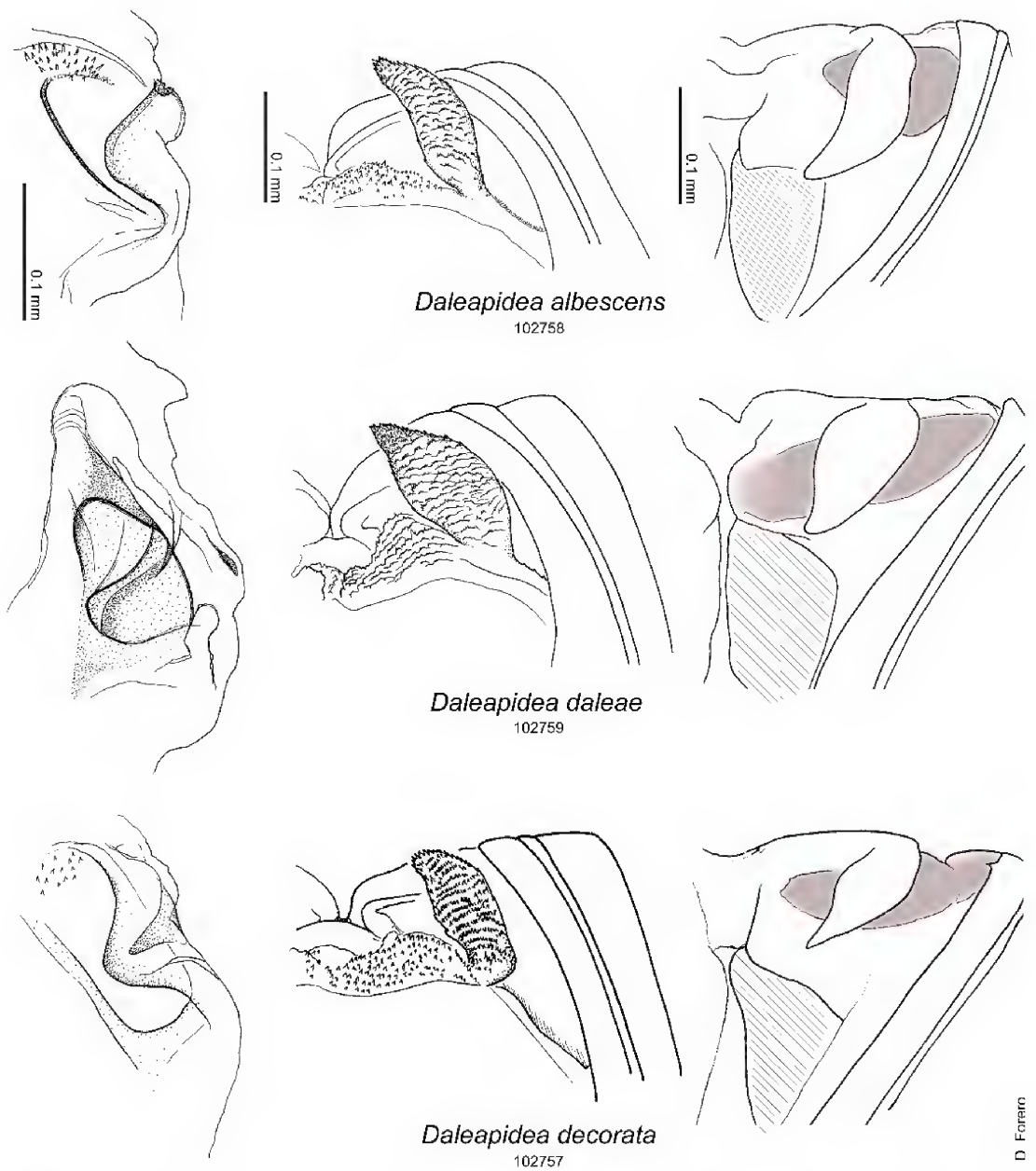

Fig. 22. *Daleapidea albescens*, *D. daleae*, and *D. decorata*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic.

Female: Similar to male, larger and wider, total length 4.22–4.69. COLORATION: Mostly similar to male. HEAD: Clypeus bright orange; first antennal segment reddish black. ABDOMEN: Ovipositor black; sternite IX black. STRUCTURE: Similar to male. GENITALIA: Interramal sclerites subquadrangular, not reaching medial area (fig. 22); dorsal lobes of interramal sclerites oblong, barely elongate (fig. 22); sclerotized rings not well sclerotized, accessory lateral piece inconspicuous (fig. 22); ventral protuberance of

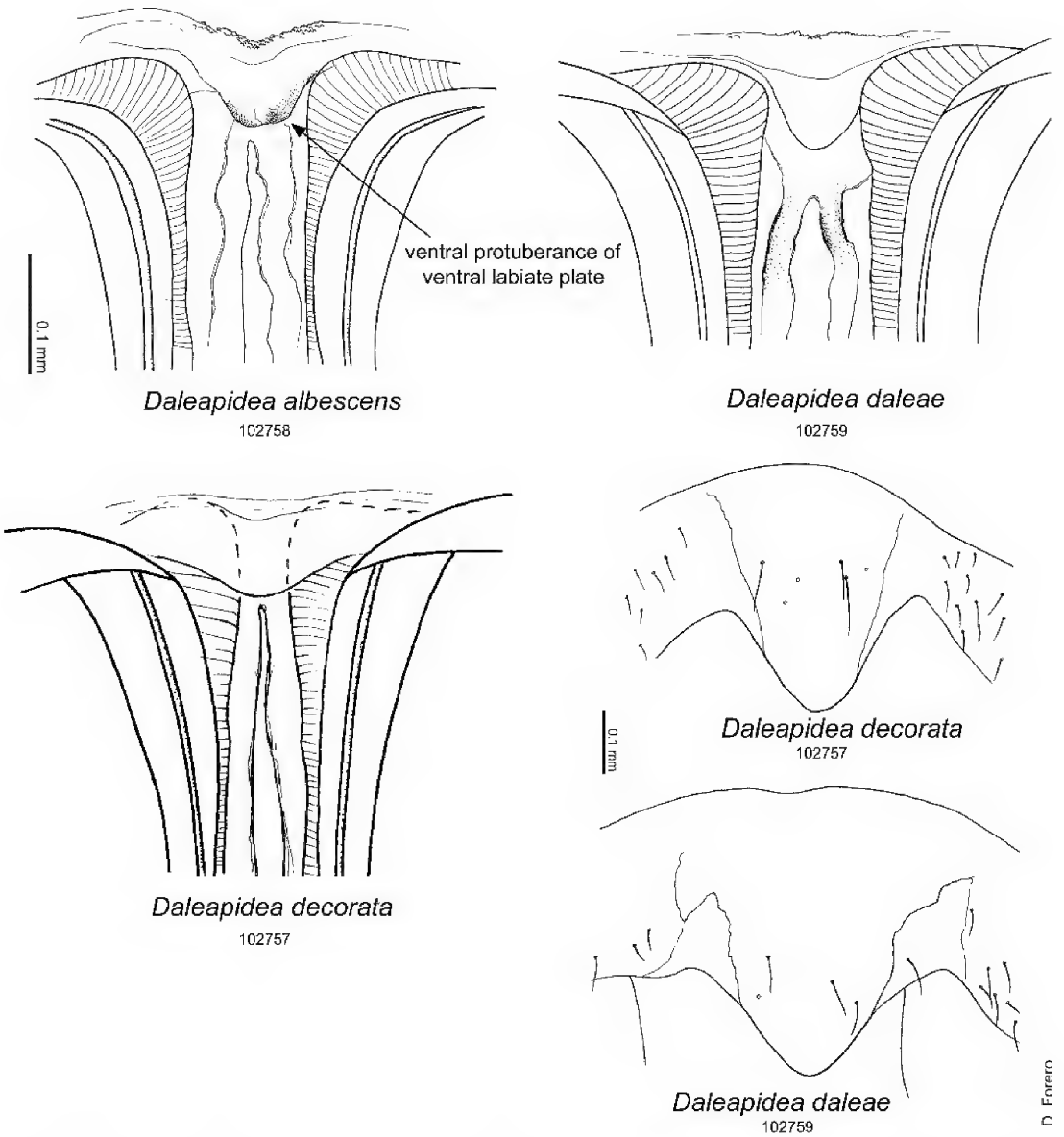

Fig. 23. *Daleapidea albescens*, *D. daleae*, and *D. decorata*. Female genitalia: anterior wall and bases of first gonapophysis, posterior view; subgenital plate, ventral view.

ventral labiate plate weakly sclerotized (fig. 23).

DISTRIBUTION: Owens Valley (California) and adjacent Great Basin (Nevada), and desert areas of southernmost California (fig. 19).

HOSTS: Most of the specimens studied were found on *Psorothamnus emoryi* and *P. polydenius* (Schuh, 1989), and some others on *Dalea* sp., all belonging to the Fabaceae. The *Tetradymia* (Asteraceae) and *Tiquilia* (Boraginaceae) records are probably sitting ones due to the paucity of specimens found on each plant. Alternatively, the *Tiquilia* record may be an association with a meloid host plant, because *Phodaga alticeps* LeConte feeds mainly on *Tiquilia* (see below) (as *Coldenia*, Pinto, 1984).

Some female specimens collected by J.D. Pinto at "Salton City, CA" (AMNH_PBI

00082998–AMNH_PBI 00083000) were associated with dead *Phodaga alticeps* (Meloidae), which is the first association to meloid beetles for any species of *Daleapidea*.

DISCUSSION: *Daleapidea albescens* is peculiar among *Daleapidea* species due to the structure of the left paramere, in particular the enlarged middorsal process, and by having a normally developed metathoracic scent-gland peritreme and evaporatory area. Nevertheless, in all species of the genus the dorsal setae of the left paramere are grouped together on a single central sensory area in contrast to what is seen in other genera of the *Hadronema* group, in which the setae occupy a more caudal and extended area. The apical setae of the dorsal prolongation in *D. albescens* are considered homologous to the setae on the flat surface of the sensory lobe of the other two species of *Daleapidea*.

Daleapidea albescens is sympatric with *D. daleae*. Both species feed on *Psorothamnus emoryi* and *P. polydenius*. *Daleapidea decorata*, which feeds on *P. polydenius*, is found only in Baja California (fig. 19).

HOLOTYPE MALE (not examined): **USA: California:** ***Riverside Co.:*** Palm Springs, 21 May 1917, E.P. Van Duzee, 1♂ (CAS).

OTHER SPECIMENS EXAMINED: **USA: Arizona:** ***La Paz Co.:*** Parker, 34.15002°N 114.28911°W, 129 m, 16 May 1980, J.G. and B.L. Rozen, 1♀ (AMNH_PBI 00100459) (AMNH). ***Yuma Co.:*** Yuma County, 32.72528°N 114.62361°W, 20 Dec 1939, L.L. Stitt, 1♂ (AMNH_PBI 00105598) (TAMU). **California:** ***Imperial Co.:*** 12 mi W of Calexico, at base of Mount Signal, 32.6788°N 115.6392°W, −4 m, 15 Apr 1974, J.D. Pinto, *Tiquilia palmeri* (Boraginaceae), 1♀ (AMNH_PBI 00082997) (UCR). 3 mi W Salton City, 33.29°N 116.007°W, 24 Apr 1983, J.D. Pinto, associated with dead *Phodaga alticeps* (Meloidae), 3♀ (AMNH_PBI 00082998–AMNH_PBI 00083000) (UCR). 3.5 mi NW of Glamis Algodones Dunes, 33.033°N 115.113°W, 13 Apr 1968, E.I. Schlinger, 1♂ (AMNH_PBI 00082993); *Dalea* sp. (Fabaceae), 1♂ (AMNH_PBI 00082941) (UCR). 5.4 mi NW of Ocotillo on Rt S2, 32.79381°N 116.05899°W, 23 Apr 1980, Schwartz and Russell, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 8♂ (AMNH_PBI 00100311–AMNH_PBI 00100318), 7♀ (AMNH_PBI 00100452–AMNH_PBI 00100458) (AMNH). Travertine Rock, 33.42305°N 116.05888°W, 22 m, 24 Apr 1949, R.A. Flock, *Dalea* sp. (Fabaceae), 11♂ (AMNH_PBI 00082982–AMNH_PBI 00082992), 3♀ (AMNH_PBI 00082994–AMNH_PBI 00082996) (UCR). ***Inyo Co.:*** 2 mi S Oasis, 37.45°N 117.917°W, 26 Apr 1941, Timberlake, *Psorothamnus emoryi* (Fabaceae), 1♂ (AMNH_PBI 00079782), 1♀ (AMNH_PBI 00079793) (UCB), 1♂ (AMNH_PBI 00083046), 6♀ (AMNH_PBI 00083047–AMNH_PBI 00083052) (UCR). 21.7 mi E of Rt 395 on Westgard Pass Road, 37.32859°N 118.04468°W, 1560 m, 02 Jul 1980, R.T. Schuh, *Psorothamnus polydenius* (Torr.) Rydb. (Fabaceae), 22♂ (AMNH_PBI 00100259–AMNH_PBI 00100276, AMNH_PBI 00100284–AMNH_PBI 00100286, AMNH_PBI 00102772), 11♀ (AMNH_PBI 00100480–AMNH_PBI 00100490) (AMNH); *Psorothamnus polydenius* Rydb. (Fabaceae), 3♂ (AMNH_PBI 00065289–AMNH_PBI 00065291), 3♀ (AMNH_PBI 00065292–AMNH_PBI 00065294) (JTP). 6 mi N of Bishop Fish Slough, 37.45474°N 118.40166°W, 15 Jun 1973, J.D. Pinto, 2♂ (AMNH_PBI 00100287, AMNH_PBI 00100288) (AMNH), 3♂ (AMNH_PBI 00082976–AMNH_PBI 00082978), 3♀ (AMNH_PBI 00082979–AMNH_PBI 00082981) (UCR); 22 Jun 1978, J.D. Pinto, 1♀ (AMNH_PBI 00100448) (AMNH); *Dalea* sp. (Fabaceae), 23♂ (AMNH_PBI 00082915–AMNH_PBI 00082929, AMNH_PBI 00082942–AMNH_PBI 00082949), 15♀ (AMNH_PBI 00082930–AMNH_PBI 00082939, AMNH_PBI 00082950–AMNH_PBI 00082954) (UCR). 9 mi NE of Big Pine, 37.257°N 118.17301°W, 1920 m, 09 Jun 1966, W. Gagne, 1♀ (AMNH_PBI 00080038) (UCB). Antelope Springs, 37.33111°N 118.08639°W, 14 Jun 1961, C.A. Toschi, 1♀ (AMNH_PBI 00079794) (UCB); 15 Jun 1961, C.A. Toschi, 1♂ (AMNH_PBI 00079780), 1♀ (AMNH_PBI 00079795) (UCB). Deep Spring Lake Flats, Route 168, 37.3°N 117.9°W, 1603 m, 12 Jul 1980, G.M. Stonedahl, 11♂ (AMNH_PBI 00100300–AMNH_PBI 00100310), 18♀ (AMNH_PBI 00100460–AMNH_PBI 00100476, AMNH_PBI 00100487) (AMNH). Deep Springs Lake Flat, Route 168, 37.3°N 117.9°W, 1644 m, 12 Jul 1980, R.T. Schuh and G.M. Stonedahl, *Psorothamnus polydenius* (Torr.) Rydb. (Fabaceae), 7♂ (AMNH_PBI 00100277–AMNH_PBI 00100283), 8♀ (AMNH_PBI 00100477–AMNH_PBI 00100479, AMNH_PBI 00100491–

AMNH_PBI 00100494, AMNH_PBI 00102758) (AMNH). ***Mono Co.:*** Benton Hot Springs, 37.81917°N 118.47556°W, 08 Jun 1966, W. Gagne, 1♂ (AMNH_PBI 00079781) (UCB). ***Riverside Co.:*** 18.1 mi W Blythe, 33.60988°N 114.9109°W, 24 Oct 1951, Timberlake, *Psorothamnus emoryi* (Fabaceae), 16♂ (AMNH_PBI 00083001–AMNH_PBI 00083016), 29♀ (AMNH_PBI 00083017–AMNH_PBI 00083045) (UCR). 3 mi E of Mecca, 33.5766°N 116.0555°W, 98 m, 27 Apr 1952, Timberlake, *Psorothamnus emoryi* (Fabaceae), 1♀ (AMNH_PBI 00083054) (UCR). Coachella, 33.6803°N 116.17389°W, 02 May 1918, J.C. Bradley, 1♀ (AMNH_PBI 00125441) (CUIC). Indio, 33.72056°N 116.21472°W, 02 May 1918, J.C. Bradley, 1♀ (AMNH_PBI 00125440) (CUIC). Palm Springs, 33.83028°N 116.54444°W, 14 May 1941, Timberlake, *Psorothamnus emoryi* (Fabaceae), 1♀ (AMNH_PBI 00083055) (UCR). ***San Bernardino Co.:*** 24 mi W of Rice, 34.0709°N 115.24152°W, 358 m, 09 May 1980, J.G. and B.L. Rozen, 1♂ (AMNH_PBI 00100299) (AMNH). ***San Diego Co.:*** Anza-Borrego Desert State Park, Carrizo Creek, 10.2 mi NW of Ocotillo on Rt S2, 32.87°N 116.1°W, 23 Apr 1980, M.D. Schwartz and L. Russell, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 1♀ (AMNH_PBI 00100450) (AMNH). Anza-Borrego Desert State Park, Elephant Tree trail, 4.7 mi S Ocotillo Wash, 33.05832°N 116.13287°W, 166 m, 22 Apr 1980, M.D. Schwartz and L. Russell, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 1♀ (AMNH_PBI 00100449) (AMNH). Anza-Borrego Desert State Park, Fish Creek Campground, 33.0257°N 116.1088°W, 122 m, 22 Apr 1980, L. Russell and M.D. Schwartz, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 1♀ (AMNH_PBI 00100451) (AMNH). Borrego, 33.22111°N 116.33333°W, 28 Apr 1955, R.O. Schuster, 1♂ (AMNH_PBI 00079779) (UCB). Coyote Canyon, Borrego, 33.3617°N 116.40362°W, 305 m, 27 Aug 1954, Timberlake, *Psorothamnus emoryi* (Fabaceae), 1♀ (AMNH_PBI 00083053) (UCR). San Diego County, 32.71528°N 117.15639°W, collector unknown, 1♀ (AMNH_PBI 00125439) (CUIC). **Nevada:** ***Nye Co.:*** 2 mi E of Tonopah, 38.06722°N 117.19244°W, 1890 m, 08 May 1966, W. Gagne, 1♀ (AMNH_PBI 00080037) (UCB). Atomic Test Site, 7.5 mi W Mercury Hwy, Cane Springs Rd (A26), 36.6°N 116.1°W, 1158 m, 06 Jun 1983, R.T. Schuh, M.D. Schwartz, G.M. Stonedahl, *Psorothamnus polydenius* (Torr. ex S. Wats.) Barneby (Fabaceae), 9♂ (AMNH_PBI 00100291–AMNH_PBI 00100298, AMNH_PBI 00101214) (AMNH). Atomic Test Site, Rock Valley on Jackass Flat Rd (A25), 36.6851°N 116.4°W, 1006 m, 06 Jun 1983, R.T. Schuh, M.D. Schwartz, G.M. Stonedahl, light trap, 8♀ (AMNH_PBI 00100440–AMNH_PBI 00100447) (AMNH). Atomic Test Site, Rock Valley on Jackass Flats Rd, 36.80111°N 116.3125°W, 1006 m, 06 Jun 1983, Schuh, Schwartz, and Stonedahl, light trap, 2♂ (AMNH_PBI 00100289, AMNH_PBI 00100290) (AMNH). Beatty, 36.90855°N 116.7592°W, 1008 m, 23 Jun 1967, W. Gagne, light trap, 3♀ (AMNH_PBI 00079797–AMNH_PBI 00079799) (UCB). ***Washoe Co.:*** Nixon, 39.83194°N 119.35694°W, 21 Jun 1960, F.D. Parker, *Tetradymia canescens* (Asteraceae), 1♀ (AMNH_PBI 00105597) (TAMU). S shore of Pyramid Lake, 39.8647°N 119.43752°W, 17 Jun 1966, W. Gagne, *Dalea* sp. (Fabaceae), 3♂ (AMNH_PBI 00079783–AMNH_PBI00079785), 7♀ (AMNH_PBI 00079786–AMNH_PBI 00079792) (UCB).

Daleapidea daleae Knight
Figures 2, 19–23

Daleapidea daleae Knight, 1968: 101 [n. sp.]; Henry and Wheeler, 1988: 407 [catalog]; Schuh, 1989: 163 [redescription, distribution, hosts]; Schuh, 1995: 102 [catalog].

DIAGNOSIS: Recognized by the black head with grayish body (fig. 2); the second antennal segment expanded distally in the male (fig. 2); metathoracic scent-gland peritreme and evaporatory area absent (fig. 20B); and ventrally curved metafemur weakly excavated and beset with numerous setae.

Daleapidea daleae is easily distinguished from the other two species of *Daleapidea* by the gray and black coloration (fig. 2), the more subbasally enlarged first antennal segment (fig. 2), and by the structure of the male genitalia (fig. 21).

REDESCRIPTION: *Male:* Large size, total length 4.17–4.59. COLORATION: Black with gray dorsum and black markings (fig. 2). HEAD: Dorsally shiny black; vertex with area next to eyes pale brown, sometimes spots whitish and larger; base of head with transverse pale brown band; mandibular and

maxillary plates pale gray, maxillary plates apically black; suture at base of plates connecting antennal socket with eye black; gena, gula, and buccula pale gray; eyes black; labrum black; labium shiny black, segment I medially gray, dull, sometimes pale area reduced; antenna black. THORAX: Collar pale gray; pronotum gray, calli black with few shiny areas; mesoscutum black; scutellum basally black, apically and laterally pale, sometimes more extensively whitish with dark brown spots; proepisternum and proepimeron pale gray, black round spot at base of procoxal suture; mesepisternum black, dorsally pale gray, coxal suture black; mesepimeron pale gray, mesothoracic spiracle black; metepisternum pale gray dorsally black; prosternum pale gray, laterally with two small black markings; mesosternum anteriorly black, posteriorly pale gray. *Hemelytra:* Pale gray, inner margin dark brown, surface spotted with small dark brown markings, embolium whitish; cuneus mostly pale gray; membrane translucent, posterolateral margin with a light brown marking, veins dark brown. *Legs:* Black; basal portion of meso- and metatrochanter pale; anterior surface of coxae pale gray. ABDOMEN: Black; sternites II–VI with a medial pale marking. GENITALIA: Genital capsule black; proctiger dark brown; parameres black. STRUCTURE: HEAD (fig. 20A): Shiny; buccula not expanded laterally, with very short sparse setae; labrum half as long as buccula; labium almost reaching mesocoxa; apex of antennal segment II expanded laterally on distal half, densely setose. THORAX: Disc of scutellum flat; proepisternum with short setae; metepisternum with evaporatory area and peritreme absent (fig. 20B). *Legs:* Coxae, trochanters, pro- and mesofemur with short setae; metafemur curved ventrally, weakly excavated, beset with numerous delicate setae as long as femoral width; protibia with expanded area covered laterally with dense, enlarged setae (fig. 20C); mesotarsus with lateral, long, delicate setae. ABDOMEN: Sternites with short sparse setae; segments III–VI weakly keeled medially. GENITALIA (fig. 21): Ventrolateral right projection of genital capsule wide and truncate; left paramere with apicoventral process acute, apex of paramere not produced dorsally, medial dorsal surface rounded, not produced; right paramere apically rounded, dorsal process small, blunt; left spicule with rami not expanded apically, denticulate, not reaching apex of right spicule; right spicule abruptly curved upward, narrowly parallel toward apex, acute, obscurely denticulate apically.

Female: Similar to male, larger and wider, total length 4.40–4.72. COLORATION: Similar to male (fig. 2). ABDOMEN: Sternites mostly whitish ventrally, darkened submarginally, area surrounding spiracles whitish; sternite IX dark brown anteriorly, pale posteriorly; subgenital plate dark brown; ovipositor dark brown. STRUCTURE: HEAD: Antennal segment II apically only weakly expanded. THORAX: *Legs:* Metafemur curved posteriorly, not ventrally, neither excavated nor with long setae. GENITALIA: Interramal sclerites ovate, long, medial margin weakly sclerotized (fig. 22); dorsal lobes of interramal sclerites strongly ovate, microtrichia arranged in scalelike fashion (fig. 22); sclerotized rings well sclerotized, curved lateral margin reaching medial margin, posterior medial margin produced caudad, accessory lateral piece distally sclerotized, narrow, and acute (fig. 22); ventral protuberance of ventral labiate plate not sclerotized (fig. 23).

DISTRIBUTION: West margin of the Great Basin (Nevada) and desert areas of southernmost California (fig. 19).

HOSTS: *Daleapidea daleae* has been collected exclusively on species of *Psorothamnus* (Fabaceae): *P. emoryi*, *P. fremontii*, *P. polydenius*, and *P. schottii* (Schuh, 1989). Knight (1968) named *D. daleae* as such because it was collected on a *Psorothamnus* species previously placed in *Dalea*.

DISCUSSION: *Daleapidea daleae* is sympatric with *D. albescens* throughout most of its range, in particular in southernmost California. Schuh (1989) pointed out that *D. daleae* has wasplike movements.

HOLOTYPE MALE: **USA**: **Nevada**: ***Nye Co.***: Mercury, CM, [36.66056°N 115.99361°W], 13 Jun 1965, E. Beck, H. Knight, J. Merino, 1♂ (AMNH_PBI 00070390) (USNM).

PARATYPES: **USA**: **California**: ***Riverside Co.***: 4 mi E of Edom, 33.8°N 116.32°W, 17 Apr 1937, Timberlake, *Psorothamnus schottii* (Fabaceae), 3♂ (AMNH_PBI 00070401–

AMNH_PBI 00070403), 1♀ (AMNH_PBI 00070400) (USNM). Edom, 33.80694°N 116.39111°W, 66 m, 17 Apr 1937, Timberlake, *Dalea* sp. (Fabaceae), 1♀ (AMNH_PBI 00105593) (TAMU). **Nevada**: ***Clark Co.***: 5.8 mi W of Valley of Fire State Park, 36.27417°N 115.17456°W, 845 m, 17 May 1978, R.T. Schuh, *Psorothamnus fremontii* (Fabaceae), 2♂ (AMNH_PBI 00070405, AMNH_PBI 00070406), 2♀ (AMNH_PBI 00070407, AMNH_PBI 00070408) (USNM). ***Nye Co.***: Mercury, CM, 36.66056°N 115.99361°W, 13 Jun 1965, E. Beck, H. Knight, J. Merino, 2♀ (AMNH_PBI 00105594, AMNH_PBI 00105595) (TAMU), 1♂ (AMNH_PBI 00070399), 7♀ (AMNH_PBI 00070391, AMNH_PBI 00070393–AMNH_PBI 00070398) (USNM); 10 Jun 1965–13 Jun 1965, E. Beck, H. Knight, J. Merino, 2♂ (AMNH_PBI 00105591, AMNH_PBI 00105592) (TAMU); 10 Jun 1965, E. Beck, H. Knight, J. Merino, *Psorothamnus fremontii* (Fabaceae), 1♀ (AMNH_PBI 00070392), *Psorothamnus polydenius* (Fabaceae), 1♂ (AMNH_PBI 00070404) (USNM).

Other Specimens Examined: **USA**: **California**: ***Imperial Co.***: 5.2 mi SE Kane Spring, 33.055°N 115.771°W, 15 Apr 1949, Timberlake, *Psorothamnus emoryi* (Fabaceae), 3♂ (AMNH_PBI 00082962–AMNH_PBI 00082964), 3♀ (AMNH_PBI 00082972–AMNH_PBI 00082974) (UCR). 5.4 mi NW of Ocotillo on Rt S2, 32.79381°N 116.05899°W, 23 Apr 1980, Schwartz and Russell, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 2♂ (AMNH_PBI 00100319, AMNH_PBI 00100320) (AMNH). 7 mi NW of Ocotillo, 32.8°N 116°W, 16 Apr 1973, J.G. and K.C. Rozen, 4♀ (AMNH_PBI 00100234–AMNH_PBI 00100237) (AMNH). Palm Canyon wash, 32.76833°N 116.10027°W, 280 m, 14 Apr 1998, J.D. Barry, 1♀ (AMNH_PBI 00082940) (UCR). Truckhaven, 33.2963°N 115.9785°W, −17 m, 15 Apr 1949, Timberlake, *Psorothamnus emoryi* (Fabaceae), 5♂ (AMNH_PBI 00082955–AMNH_PBI 00082959), 2♀ (AMNH_PBI 00082969, AMNH_PBI 00082970) (UCR). ***Inyo Co.***: 21.7 mi E of Rt 395 on Westgard Pass Road, 37.32859°N 118.04468°W, 1560 m, 02 Jul 1980, R.T. Schuh, *Psorothamnus polydenius* (Torr.) Rydb. (Fabaceae), 4♂ (AMNH_PBI 00100338–AMNH_PBI 00100341), 4♀ (AMNH_PBI 00100231–AMNH_PBI 00100233, AMNH_PBI 00102759) (AMNH). Antelope Springs, 37.33111°N 118.08639°W, 14 Jun 1961, C.A. Toschi, 1♂ (AMNH_PBI 00079804) (UCB); 15 Jun 1961, C.A. Toschi, 1♂ (AMNH_PBI 00079803) (UCB). ***Riverside Co.***: 10 mi E of Mecca, 33.57°N 115.9°W, 09 Apr 1974, J.D. Pinto, 1♂ (AMNH_PBI 00082965) (UCR); 07 Apr 1966, W.J. Turner, *Psorothamnus schottii* (Fabaceae), 4♂ (AMNH_PBI 00079800–AMNH_PBI 00079802, AMNH_PBI 00080039), 2♀ (AMNH_PBI 00079807, AMNH_PBI 00080040) (UCB). 4 mi E of Edom, 33.8°N 116.32°W, 17 Apr 1937, Timberlake, *Psorothamnus schottii* (Fabaceae), 1♀ (AMNH_PBI 00082975) (UCR). 4 mi S of Palm Desert, Boyd Desert Research Center, 33.66439°N 116.37361°W, 12 Apr 1963, P.D. Hurd, 1♂ (AMNH_PBI 00079805) (UCB); 06 Apr 1963, C.A. Toschi, 1♀ (AMNH_PBI 00079810) (UCB). Box Canyon, 33.5918°N 115.98°W, 98 m, 27 Apr 1952, Timberlake, *Psorothamnus schottii* (Fabaceae), 1♀ (AMNH_PBI 00082971) (UCR); 05 Apr 1966, Timberlake, *Psorothamnus schottii* (Fabaceae), 2♂ (AMNH_PBI 00082960, AMNH_PBI 00082961) (UCR). ***San Diego Co.***: Anza-Borrego Desert State Park, Carrizo Creek, 10.2 mi NW of Ocotillo on Rt S2, 32.87°N 116.1°W, 23 Apr 1980, M.D. Schwartz and L. Russell, *Psorothamnus emoryi* (Gray) Rydb. (Fabaceae), 2♂ (AMNH_PBI 00100326, AMNH_PBI 00100327) (AMNH). Borrego, 33.22111°N 116.33333°W, 24 Apr 1955, M. Wasbauer, 1♂ (AMNH_PBI 00079806), 2♀ (AMNH_PBI 00079808, AMNH_PBI 00079809) (UCB). **Nevada**: ***Churchill Co.***: 23 mi E Fallon, 39.47281°N 118.34448°W, 21 Jul 1958, J.W. McSwain, *Psorothamnus polydenius* (Fabaceae), 2♀ (AMNH_PBI 00079811, AMNH_PBI 00079812) (UCB). ***Clark Co.***: 5.8 mi W of Valley of Fire State Park, 36.27417°N 115.17456°W, 845 m, 17 May 1978, R.T. Schuh, *Psorothamnus fremontii* (Fabaceae), 16♂ (AMNH_PBI 00100192–AMNH_PBI 00100201, AMNH_PBI 00100230, AMNH_PBI 00100321–AMNH_PBI 00100324, AMNH_PBI 00102766), 28♀ (AMNH_PBI 00100202–AMNH_PBI 00100229) (AMNH), *Psorothamnus fremontii* (Fabaceae), 6♂ (AMNH_PBI 00065015–AMNH_PBI 00065020), 6♀ (AMNH_PBI 00065009–AMNH_PBI 00065014) (JTP). ***Nye Co.***: 10 mi NW Beatty, 37°N 116.8°W, 15 May 1985, W.F. Chamberlain, 1♀ (AMNH_PBI 00105596) (TAMU). 2.5 mi E of Gabbs on Route 844, 38.8°N 117.8°W, 1615 m, 01 Jul 1983, R.T. Schuh, M.D. Schwartz, *Psor-*

othamnus polydenius (Torr. ex S. Wats.) Barneby (Fabaceae), 2♂ (AMNH_PBI 00100328, AMNH_PBI 00100329), 2♀ (AMNH_PBI 00100238, AMNH_PBI 00100239) (AMNH). Atomic Test Site, 2.6 mi W of Mercury Hwy, Cane Springs Rd (A5), 36.66056°N 116.04046°W, 1036 m, 06 Jun 1983, Schuh, Schwartz, and Stonedahl, *Psorothamnus fremontii* (Torr.) Barneby (Fabaceae), 4♂ (AMNH_PBI 00100333–AMNH_PBI 00100336), 11♀ (AMNH_PBI 00100240–AMNH_PBI 00100250) (AMNH). Atomic Test Site, 6.8 mi SE of Mercury Hwy on Orange Blossom Rd (A11), 36.59104°N 115.90703°W, 1219 m, 08 Jun 1983, Schuh, Schwartz, and Stonedahl, *Psorothamnus polydenius* (Torr. ex S. Wats.) Barneby (Fabaceae), 3♀ (AMNH_PBI 00100256–AMNH_PBI 00100258) (AMNH). Atomic Test Site, 7.5 mi W Mercury Hwy, Cane Springs Rd (A26), 36.6°N 116.1°W, 1158 m, 06 Jun 1983, R.T. Schuh, M.D. Schwartz, G.M. Stonedahl, *Psorothamnus polydenius* (Torr. ex S. Wats.) Barneby (Fabaceae), 3♂ (AMNH_PBI 00100330–AMNH_PBI 00100332), 5♀ (AMNH_PBI 00100251–AMNH_PBI 00100255) (AMNH).

Daleapidea decorata (Uhler)
Figures 19, 21–23

Hadronema decorata Uhler, 1894: 251 [n. sp.]; Carvalho, 1958: 68 [catalog].
Hadronema decoratum: Steyskal, 1973: 207 [emendation].
Hadronema (*Aoplonema*) *decoratum*: Henry and Wheeler, 1988: 410 [catalog].
Daleapidea decorata: Schuh, 1989: 165 [new combination, redescription, distribution, hosts]; Schuh, 1995: 102 [catalog].

DIAGNOSIS: Recognized by the bright orange scutellum and the overall black dorsum with a white fascia on claval suture and a white cuneus (fig. 2); the setose legs and abdomen; and the narrow apex of the right paramere on male (fig. 21).

Daleapidea decorata is easily distinguished from *D. albescens* and *D. daleae* by the darker hemelytra with white cuneus (fig. 2), and by the structure of the right paramere (fig. 21).

REDESCRIPTION: *Male*: Medium size, total length 3.78–4.31. COLORATION: Black with white and orange markings (fig. 2). HEAD: Black; clypeus with three longitudinal irregular shiny spotted areas, apically shiny black; frons with two longitudinal areas of oblique irregular shiny lines; vertex next to eyes weakly pale brown; mandibular plates yellow brown; maxillary plates reddish black, apically shiny black; suture at base of plates connecting antennal socket with eye black; gena anteriorly and below eyes pale brown; eyes black; labrum and labium dark brown, shiny, labial segment I weakly dull; antennae black. THORAX: Collar and pronotum black, calli black with shiny areas, posterior lobe of pronotum with wrinkles suffused with dark gray; mesoscutum medially pale orange, laterally black; scutellum bright orange; proepisternum black; proepimeron black anteriorly, suffused with black posteriorly; meso- and metapleuron black, sometimes reddish black at center; apex of prosternum gray; venter black. *Hemelytra*: Black; clavus black with anal vein and area adjacent to claval suture whitish; corium black, embolium whitish; cuneus white, posteriorly black; membrane fuscous, veins black. *Legs*: Black. ABDOMEN: Black, sternites medially weakly pale. GENITALIA: Genital capsule and parameres black, proctiger dark brown. STRUCTURE: HEAD: Dull; buccula not expanded laterally, with not so long sparse setae; labrum about half as long as buccula; labium reaching mesocoxa; apex of antennal segment II not expanded, cylindrical, uniformly setose. THORAX: Scutellum anteriorly concave, disc weakly rounded; proepisternum with long setae, weakly produced laterally; metepisternum with peritreme and evaporatory area absent. *Legs*: Coxae with medium-sized setae on anterior and posterior surfaces; trochanters with sparse medium-sized setae; pro- and mesofemur densely setose, ventral surface with setae at least half as long as femoral width; metafemur with short sparse setae, curved posteriorly in dorsal view; protibia with apical expanded area covered laterally with dense enlarged setae; mesotarsus without long lateral setae. ABDOMEN: Sternites with medium-sized dense setae; segments II–VI flat, not keeled. GENITALIA (fig. 21): Ventrolateral projection of genital capsule broad and rounded; left paramere with apicoventral process blunt, apex of

paramere dorsally not produced, medial dorsal surface rounded, not produced; right paramere apically narrow, subparallel, and rounded, medial dorsal process small and blunt; left spicule with rami subparallel, weakly denticulate, reaching apex of right spicule; right spicule gently curved upward weakly widening toward apex, finely denticulate apically.

Female: Similar to male but larger and wider, total length 4.48–4.81. COLORATION: Mostly similar to male (fig. 2). HEAD: Vertex with area next to eyes pale orange, medial marking orange; mandibular and maxillary plates orange or pale orange, maxillary plates apically black, sutures black; gena and gula orange. THORAX: Collar pale gray or orange; anterior area between calli pale orange; posterior lobe of pronotum gray; proepisternum orange, base of procoxal suture with a black spot; proepimeron anteriorly orange, posteriorly gray; meso- and metapleuron reddish black; prosternum whitish. *Legs*: Procoxa pale orange; meso- and metacoxa pale orange on medial surface; basal portion of trochanters weakly pale; femora apically with paired lateral pale orange spots. ABDOMEN: Sternites white, area below spiracles black; subgenital plate dark brown, adjacent areas on sternite VII pale; sternites VIII and IX black; ovipositor black. STRUCTURE: Similar to male. GENITALIA: Interramal sclerites ovate (fig. 22); dorsal lobes of interramal sclerites oblong, weakly elongate, densely covered with microtrichia (fig. 22); sclerotized rings with lateral margin subparallel, posterior margin weakly produced, accessory sclerite enlarged, blunt apically (fig. 22); ventral protuberance of ventral labiate plate not sclerotized, weakly produced (fig. 23).

DISTRIBUTION: Only known from central Baja California, Mexico (fig. 19).

HOSTS: The only collection event with recorded plant data is with *P. emoryi* (Fabaceae). It is not known if this species may occur on other species of *Psorothamnus*, as is the case with the other species of *Daleapidea*.

DISCUSSION: *D. decorata* is known from a few localities in Baja California. Further collecting is needed not only to expand the known range for this species, but also to address the issue of multiple hosts on species of *Psorothamnus*.

LECTOTYPE FEMALE: **MEXICO**: **Baja California**: San Luis, [28.43333°N 113.75°W], 01 Apr 1889, Charles D. Haines, "*Hadronema decorata* Uhler", P.R. Uhler collection, "*Hadronema decorata* Uhler" P. R. Uhler det., "*Hadronema decorata* Uhler" Lectotype det. R.T. Schuh, 1♀ (AMNH_PBI 00070389) (USNM).

PARALECTOTYPES: **MEXICO**: **Baja California**: San Luis, 28.43333°N 113.75°W, 01 Apr 1889, Charles D. Haines, 1♂ (AMNH_PBI 00070463), 2♀ (AMNH_PBI 00070457, AMNH_PBI 00070458) (USNM).

OTHER SPECIMENS EXAMINED: **MEXICO**: **Baja California**: 53 km W of Punta Prieta toward Bahia de los Angeles, 28.97187°N 113.73793°W, 340 m, 22 Apr 1985, R.T. Schuh and B.M. Massie, *Psorothamnus emoryi* (A. Gray) Rydb. (Fabaceae), 53♂ (AMNH_PBI 00100342–AMNH_PBI 00100380, AMNH_PBI 00100413–AMNH_PBI 00100425, AMNH_PBI 00102773), 47♀ (AMNH_PBI 00100381–AMNH_PBI 00100412, AMNH_PBI 00100426–AMNH_PBI 00100439; AMNH_PBI 00102757) (AMNH), *Psorothamnus emoryi* (A. Gray) Rydb. (Fabaceae), 2♂ (AMNH_PBI 00070461, AMNH_PBI 00070462), 2♀ (AMNH_PBI 00070464, AMNH_PBI 00070465) (USNM).

Hadronema Uhler

Type species: *Hadronema militaris* Uhler, 1872 (by monotypy).

Hadronema Uhler, 1872: 412 [n. gen.]; Gibson, 1918: 81 [key to spp.]; Blatchley, 1926: 843 [diagnosis]; Knight, 1928: 177 [revision]; Carvalho, 1958: 68 [catalog]; Kelton, 1980: 225 [diagnosis, key to spp.]; Henry and Wheeler, 1988: 410 [catalog]; Schuh, 1995: 115 [catalog].

DIAGNOSIS: Recognized by the basal ventral tubercle on the fore femora of males (fig. 25D); the vestiture composed of long erect simple bristlelike setae (fig. 24F); the vesica with two spicules, one dorsal and one ventral (figs. 26, 27); the short sclerotized part of the ductus seminis (figs. 26, 27); and females with a trapezoidal sclerotized area on the anterior wall with a central tubercle projecting posteriorly into the genital chamber, reaching the ovipositor (figs. 33, 34).

Of the Orthotylini that occur in North America, *Hadronema* resembles *Lopidea*, but

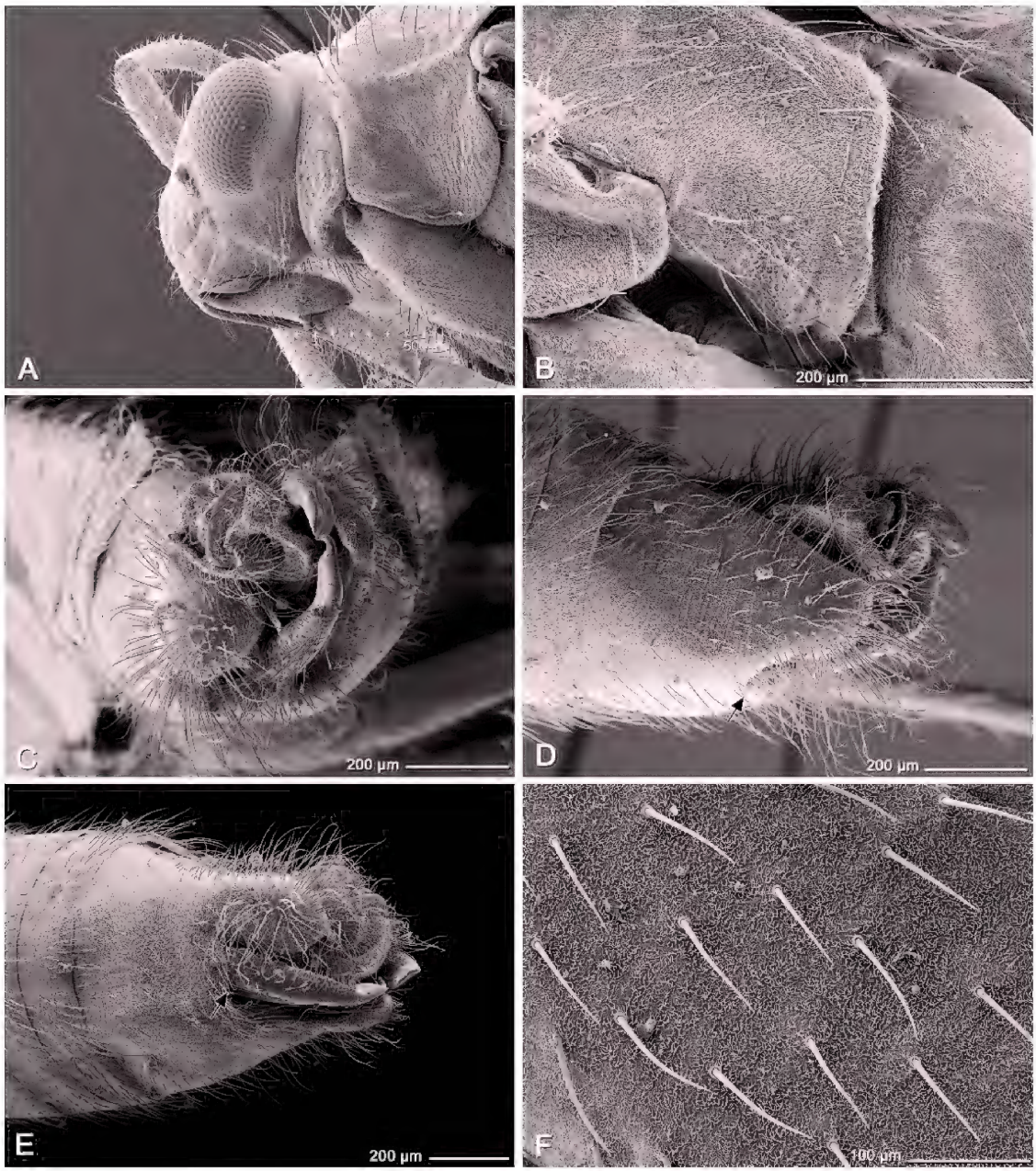

Fig. 24. *Hadronema militare*. **A**. Head and pronotum, lateral view. **B**. Mesepimeron and metepisternum. **C**. Posterior view of genital capsule. **D**. Lateral view of genital capsule. **E**. Ventral view of genital capsule. **F**. Vestiture on hemelytron. Arrows indicate insertion of left paramere.

the latter can be distinguished from the former by the shape of the vesica, the presence of a tergal process on the genital capsule, the scalelike setae on dorsum, the structure of the parameres (Asquith, 1991), and the absence of a supragenital bridge. The structure of the head is similar in the two, but in *Lopidea* the posterior margin of the vertex is flat, whereas in *Hadronema* it is elevated forming a carina and is beset with bristlelike

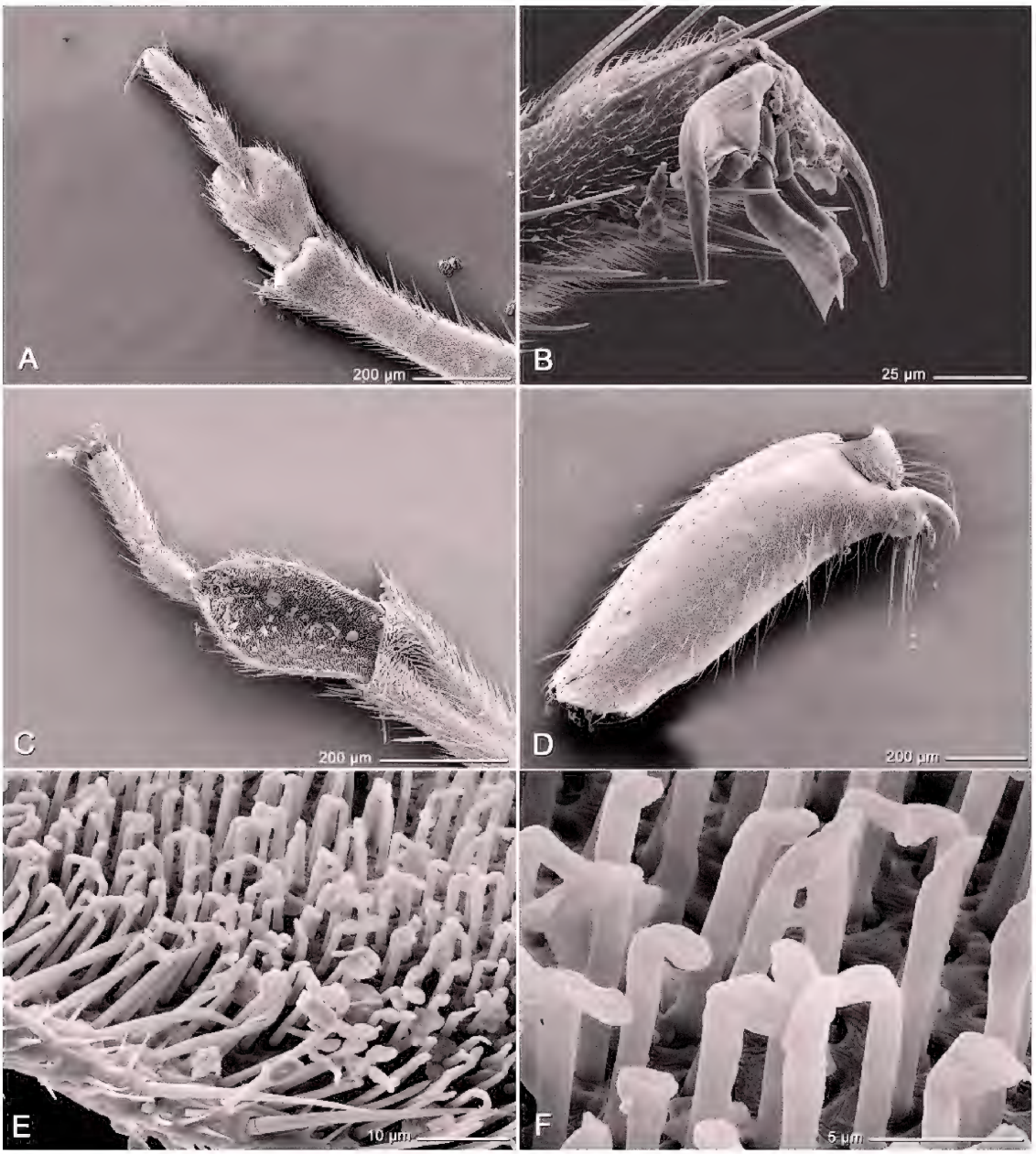

Fig. 25. *Hadronema militare*. **A**. Front tarsi of male, dorsal view. **B**. Pretarsus. **C**. Front tarsi of male, ventral view. **D**. Front femur of male, medial view. **E**. Detail of ventral surface of expanded first tarsal segment of male. **F**. Detail of tenent setae.

setae. The left paramere in *Lopidea* bears a flaplike prolongation near its apex, whereas in *Hadronema* it is acute with a ventrally directed tubercle and no flanges.

Hadronema is distinguished from *Hadronemidea* by the eyes close to the anterior margin of the pronotum, straight mesotibia in males, and shorter sclerotized part of the ductus seminis, whereas in *Hadronemidea* the eyes are smaller and removed from the pronotum, the mesotibia is curved in males, and the sclerotized part of the ductus seminis

is longer. From *Origonema*, males can be separated by the cylindrical, straight mesotibia, not subbasally swollen, and for having the first tarsal segment laterally expanded on the forelegs. From *Daleapidea*, it is easily distinguished by the first antennal segment not thickened in males, the genital capsule either subtriangular or subquadrangular, and by the nearly cylindrical protibia on males. *Hadronema* is further distinguished from *Daleapidea*, *Hadronemidea*, and *Origonema* by the flattened right spicule of the vesica located dorsally over the left one, and with the apex directed left, not curved upward. *Hadronema* females are easily distinguished from the remaining genera of the group by the medial, nearly rounded or trapezoidal, sclerotization on the anterior wall bearing a medial caudad tubercle.

REDESCRIPTION: *Male*: Usually robust, ranging from small to large, total length 2.60–4.45. COLORATION: Black, usually with a narrow white embolium, white markings on cuneus, and red markings on pronotum; paler coloration with more extensive yellowish and orange markings on legs and hemelytra in some species (figs. 2, 3). SURFACE AND VESTITURE: Surface smooth, dull, beset with dense macrotrichia; dark erect bristlelike simple setae on head, dorsum, and hemelytra (fig. 24F). STRUCTURE: HEAD (fig. 24A): Transverse, strongly declivent, almost oval in lateral view; clypeus barely noticeable in dorsal view, protruding basally, with short setae; frons convex; vertex weakly convex, almost flat, never concave; vertex and frons with sparse bristlelike setae; transverse carina strongly elevated, not sharp, with a row of bristlelike setae; mandibular and maxillary plates occupying almost half the height of the head, apices rounded; gena with area of simple setae extending from behind the eyes down to buccula; eyes ovate in lateral view, nearly stalked, in dorsal view close to the anterior margin of the pronotum; gula short; labrum short, triangular, and acute, approximately as long as buccula; buccula with a single row of setae; labium surpassing procoxa but not reaching mesocoxa, segment II with numerous setae, other segments glabrous; antennal segment I barely wider in diameter than II, II and III of approximately equal diameter, IV weakly lesser in diameter than III, I and IV the shortest, II and III the longest, relative length of II and III variable. THORAX: Collar narrow, flattened; pronotum trapezoidal, posterior margin sometimes weakly sinuate, lateral margin marginate, weakly sinuate, anterior angles rounded, posterior angles broadly rounded, oblique to some extent, surface nearly flat, weakly inclined; calli well defined, not strongly elevated, with small, scattered shiny areas, not rugose, posterior lobe of pronotum broadly rugose; mesoscutum barely visible in dorsal view; scutellum triangular, nearly equilateral, weakly elevated, disc flat; pleural area with sparse delicate long simple setae; metepisternum densely covered with macrotrichia; metathoracic scent-gland evaporatory area rounded on its dorsal margin, not reaching level of dorsal portion of metacoxa; peritreme relatively enlarged in relation to evaporatorium, sometimes evaporatorium extremely reduced and peritreme greatly enlarged, in which case only scent-gland channel and part of evaporative area evident (fig. 24B); prosternum margined with long delicate setae. *Hemelytra*: Nearly parallel, weakly curved at level of claval commissure; clavus elevated with respect to corium and deflexed along claval suture; corium deflexed laterally from medial fracture; cuneus weakly deflexed, as long as wide; membrane about half as long as hemelytron. *Legs*: Coxae elongate, with sparse short setae; trochanters oval, with numerous delicate long setae; profemur and mesofemur of approximately equal length, metafemur longest; profemur basally enlarged narrowing distally, 1.5 times as wide as meso- and metafemur, with a basal ventrally directed, acute, bifid projection, sometimes apparently not bifid, with long bristlelike setae arising from the process, basal half of mesofemur with setae as long as femora width; tibiae straight, protibia wider than meso- and metatibia, weakly broader distally, meso- and metatibia of approximately equal diameter; protibial length approximately equal to that of mesotibia; metatibia nearly twice length of mesotibia; meso- and metatibia with strong spiniform setae; fore tarsus with first tarsomere laterally expanded, concave ventrally, enclosing basal portion of second tarsomere, ventral surface covered with

numerous small tenent setae (fig. 25A, C), setae apically bent, weakly expanded, and flat (fig. 25E, F); pretarsi as in figure 25B. ABDOMEN: Segments II–VIII with long sparse setae. GENITALIA: Genital capsule subquadrangular (fig. 29) or subtriangular in dorsal view (figs. 26, 28); aperture inclined, never vertical, weakly turned left, anterior margin weakly sclerotized; ventrolateral projecting blunt process on right side of genital capsule varying from large (fig. 29) to small (fig. 26), sometimes with a prominent rounded sensory lobe on left side (figs. 24C–E, 29); proctiger reaching apex of genital capsule (fig. 24D); cuplike sclerite not surpassing ventral projection apically, right side more strongly projecting posteriorly than left; bases of cuplike sclerite barely projecting anteriorly to supragenital bridge; supragenital bridge well sclerotized, located above insertions of parameres; insertion of right paramere above insertion of left paramere relative to a horizontal plane, sometimes insertion of left paramere almost ventral (fig. 24E); left paramere shape from weakly curved (fig. 29) to sickle-shaped (figs. 26, 28), with an apically acute ventral process; right paramere hatchet-shaped (as an inverted L) from medial view, body elongated, small flat blunt tubercle on dorsal angle directed medially, apex broadly rounded or acute (figs. 26, 28, 29); phallotheca nearly cylindrical, without any protuberances on surface, weakly cleft dorsally at point of attachment to phallobase, not forming a completely sclerotized tube covering the vesica, only dorsal and ventrodistal parts well sclerotized, weakly so in the ventroproximal part, opening directed to the left, oval-shaped, greatly reclined (figs. 26–29); vesica with two well-sclerotized spicules, ventral (left) and dorsal (right), with no sclerotized connection between them; ventral spicule curved to the left in dorsal view, expanded apically, usually flattened, toothed on its right (upper) margin from about the middle to the apex, sometimes strongly curved distally in lateral view (fig. 27), left side with two cephalad-directed preapical projections (rami), one short, one long, or subequal in length, denticulate or not; dorsal spicule short, approximately half as long as ventral spicule, located at about the middle of ventral spicule, weakly curved toward the left, apex denticulate or not; sclerotized part of ductus seminis short, located at the base of the ventral spicule, not projecting beyond the base of dorsal spicule.

Female: Similar to male, but usually larger and broader, more oval-shaped, total length 2.83–5.22. COLORATION: As in male (figs. 2, 3). SURFACE AND VESTITURE: As in male. STRUCTURE: THORAX: *Legs*: Lacking basal tubercle on profemur; first tarsal segment of protibia not expanded; setae on trochanters and mesofemur shorter. GENITALIA: Subgenital plate subtriangular, sometimes subrectangular, gently narrowing distally, apically rounded or truncate, reaching middle of sternite VIII or posterior margin of it; base of ovipositor located nearly at longitudinal midpoint of abdomen; interramal sclerites usually well sclerotized, sometimes limits relative to other membranes of posterior wall obscure, oblong, occasionally with ventral margin more produced; dorsal lobes of interramal sclerites digitiform, covered with microtrichia, rounded at apex; sigmoid process and dorsal area of interramal sclerites up to base of dorsal lobes densely covered with microtrichia; medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized modified medial structures; sclerotized rings oblong, usually posterior edge not produced, laterally recurved, small accessory sclerite on anterolateral margin; internal surface of dorsal labiate plate covered with microtrichia; inner margin of first gonapophyses symmetrical; anterior wall with a central sclerotized area, from almost round to trapezoidal, bearing one central posteriorly directed tubercle, variably covered with smaller spinelike processes, dorsalmost area weakly convex, sometimes produced as a smaller downward-directed tubercle, often transversely divided, in which case ventralmost sclerite bearing larger central tubercle.

DISTRIBUTION: Continental United States and Canada, ranging as far south as Mexico. The main area of diversity for *Hadronema* is the western United States (figs. 35, 36).

HOST ASSOCIATIONS: Many *Hadronema* species are associated with legumes and to some extent with composites. In some instances it seems that these associations are not highly species-specific, but no definitive

host-plant data are available for all *Hadronema* species. Many label data show a frequent association between *Hadronema* species and *Lupinus* (Fabaceae). Species of this plant genus have quinolizidine alkaloids that are toxic for vertebrates (Seigler, 2004), occasionally causing livestock poisoning or malformation (James et al., 1992). It is not known if these alkaloids may play any antipredation role in *Hadronema* species as occurs with some other insect species (Wink, 1992). *H. bispinosum*, *H. breviatum*, and *H. militare* have also been associated with meloid beetles or with cantharidin traps (Pinto, 1978; Young, 1984a, 1984b). Cantharidin is an insect feeding deterrent compound (Carrel and Eisner, 1974), whose role in Miridae species remains paradoxical (Wheeler, 2001).

DISCUSSION: The genital capsule of *H. militare* and *H. incognitum*, sp. nov., is peculiar in having the insertion of the left paramere almost ventral, giving the impression of a cleft. They also have a prominent bulbous sensory lobe on the left side and a posterior projection directed caudad on the right side. Other species of *Hadronema* have the genital capsule subtriangular without any conspicuous caudad prolongations. Females of these two species have an elongate subgenital plate compared to the other species of the genus, nearly reaching the posterior margin of the eighth sternite. Nevertheless, both species share with other *Hadronema* species distinctive structures of the vesica and female genitalia, in particular a central sclerotization on the anterior wall that is considered here a synapomorphy for *Hadronema* species.

The expanded first tarsomere of the forelegs in males is considered homologous with the structure also found in *Hadronemidea*. It is generally assumed that the function of tenent setae is to aid in locomotion or predation (Beutel and Gorb, 2001; Betz and Kölsh, 2004). Although observations on live specimens have not been made regarding the function of this structure in *Hadronema*, the fact of its being sexually dimorphic may suggest a grasping function during mating. At least in *Harpocera thoracica* (Miridae: Phylinae) similar attachment structures in the antennae help the male hold onto the female during copulation (Stork, 1981). The structure of these setae in *Hadronema* is nonetheless different from that in *H. thoracica*. In *Hadronema* the undersurface of the tarsus is covered with spatulate setae and not with tapering setae as in *H. thoracica*. *Hadronemidea* setae are different from either of the above, being more elongate and clubbed apically. Similar adhesive structures have been documented in various groups of Cimicomorpha (Heteroptera) (Weirauch, 2007). Analogous tarsal setae have been described in other groups of insects, for example, in Coleoptera and Dermaptera (Beutel and Gorb, 2001; Haas and Gorb, 2004). It is also probable that the basal tubercle found on the profemur of males may also be involved during the mating process in *Hadronema*.

Intraspecific variation on spicule morphology is evident in *Hadronema* species. Usually the variation tends to be restricted to the amount of serration on the rami of the ventral spicule, or on the apex of the dorsal spicule (e.g., *H. pictum*, see fig. 27). In one species, *H. mexicanum*, sp. nov., besides tuberculation, the variation also involves the overall shape of the ventral spicule. Despite this variation, there are diagnostic characters that allow identification of the taxa involved.

The medial sclerotized area found on the anterior wall of the females of *Hadronema* species is unique among the Orthotylini, and has not been documented until now. Pluot-Sigwalt and Matocq (2006) did not mention any structure on the anterior wall or the vulvar area that resembles the one described here. Usually, orthotyline females have modifications at the level of the vulvar area (e.g., Schaffner and Ferreira, 1995; Schwartz, 2004; Pluot-Sigwalt and Matocq, 2006), but rarely so on the anterior wall.

Key to the Species of *Hadronema*

1. Legs black; mostly dark species with red on the pronotum; hemelytra black contrasting with white embolium, cuneus with lateral margin white. 2
— Legs orange to yellow; pale species with orange to yellow on the pronotum; hemelytra not black, embolium and other parts of corium white, cuneus mostly white 7

2. Second antennal segment length in males equal to or greater than head width, if less, then length >0.70 mm; rami of ventral spicule subequal or not, insertions of rami close together (e.g., *H. simplex*, fig. 26 arrows) 3
— Second antennal segment length in males less than head width (ratio = 0.9, table 1), length <0.68 mm; rami of ventral spicule of subequal length, short, not reaching apex of dorsal spicule, insertions of rami wide apart from each other (fig. 26, arrows) . . . . . *H. breviatum*
3. Left paramere inserted ventrally on the genital capsule, giving the impression of a cleft (fig. 24C–E, arrows); female subgenital plate long, nearly reaching posterior margin of sternite VIII, apex broadly truncate (fig. 34) 4
— Left paramere inserted laterally on the genital capsule (e.g., fig. 28, arrow); female subgenital plate subtriangular, reaching middle of sternite VIII, apex rounded (figs. 30, 31) 5
4. Left paramere notched before apex (fig. 29, arrow); process on the right side of the genital capsule short, as long as wide in dorsal view (fig. 29, arrow) . . . . . *H. militare*
— Left paramere gently curved before apex (fig. 29, arrow); process on the right side of the genital capsule elongate, longer than wide in dorsal view (fig. 29, arrow). . . . . *H. incognitum*, sp. nov.
5. Antennal segment II in males longer than III (see table 1; ratio >1.10); evaporatory area on metepisternum either normally developed, enclosing peritreme, or greatly reduced not enclosing peritreme 6
— Antennal segments II and III in males of nearly equal length (see table 1; ratio <1.05); evaporatory area on metepisternum normally developed, enclosing peritreme. . . . *H. pictum*
6. Pronotum usually dark with posterior margin red, fading to white (fig. 3); vesical ventral spicule with one short and one long ramus, each with conspicuous denticles (fig. 26, arrows); evaporatory area on metepisternum greatly reduced, not enclosing peritreme . . . . . *H. simplex*
— Posterior lobe of pronotum red with median area usually darker (fig. 2); rami of vesical ventral spicule about the same size (fig. 27, arrows); evaporatory area on metepisternum enclosing peritreme . . . . . *H. mexicanum*, sp. nov.
7. Metafemur with a dorsal subapical dark spot (fig. 2); posterior margin of pronotum straight; rami of vesical ventral spicule long, surpassing dorsal spicule (fig. 26, arrows). . . . . *H. bispinosum*
— Metafemur completely orange, without subapical dark spots (fig. 3); posterior margin of pronotum usually sinuate; rami of vesical ventral spicule shorter, not reaching apex of dorsal spicule (fig. 26, arrows) . . . . . *H. sinuatum*

Hadronema bispinosum Knight
Figures 2, 26, 30, 33, 36

Hadronema (*Hadronema*) *bispinosa* Knight, 1928: 179 [n. sp.]; Carvalho, 1958: 68 [catalog].
Hadronema bispinosum: Steyskal, 1973: 207 [emendation]; Kelton, 1980: 226 [diagnosis, host, distribution]; Maw et al., 2000: 117 [list].
Hadronema (*Hadronema*) *bispinosum*: Henry and Wheeler, 1988: 411 [catalog].
Hadronema bispinosa: Schuh, 1995: 115 [catalog].

DIAGNOSIS: Recognized by the dark head above with a central pale stripe and two yellowish spots adjacent to eyes (fig. 2); the mostly yellowish pronotum, with black calli (fig. 2); the mostly yellowish scutellum (fig. 2); the yellowish orange femora, the metafemur with a preapical dark ring or spot (fig. 2); the yellowish venter with black markings; the normally developed evaporatory area; the subtriangular genital capsule; and the long and slender rami of the vesica of subequal length and reaching the dorsal spicule (fig. 26).

Hadronema bispinosum is easily separated from the remaining species of *Hadronema* by the yellowish coloration of the body, in particular on the ventral surface. *Hadronema sinuatum* is the most similar species in coloration (fig. 3), but this species is easily separated from *H. bispinosum* by the long, slender rami of the ventral spicule reaching the dorsal spicule (fig. 26, arrows), and by the uniform orange coloration of posterior femur with a preapical dark spot (fig. 2). *Hadronema militare* and *H. incognitum* also have long, slender rami (fig. 29), but *H. bispinosum* is separated from them by the subtriangular genital capsule and coloration. From *H. pictum* and *H. mexicanum* with similar rami structure (fig. 27), it is distinguished by coloration alone.

REDESCRIPTION: *Male*: Medium size, total length 3.03–3.55. COLORATION: Pale yellow with orange and black markings (fig. 2). HEAD: Yellowish white; clypeus black with irregular shiny black spots; frons with two longitudinal black markings and oblique

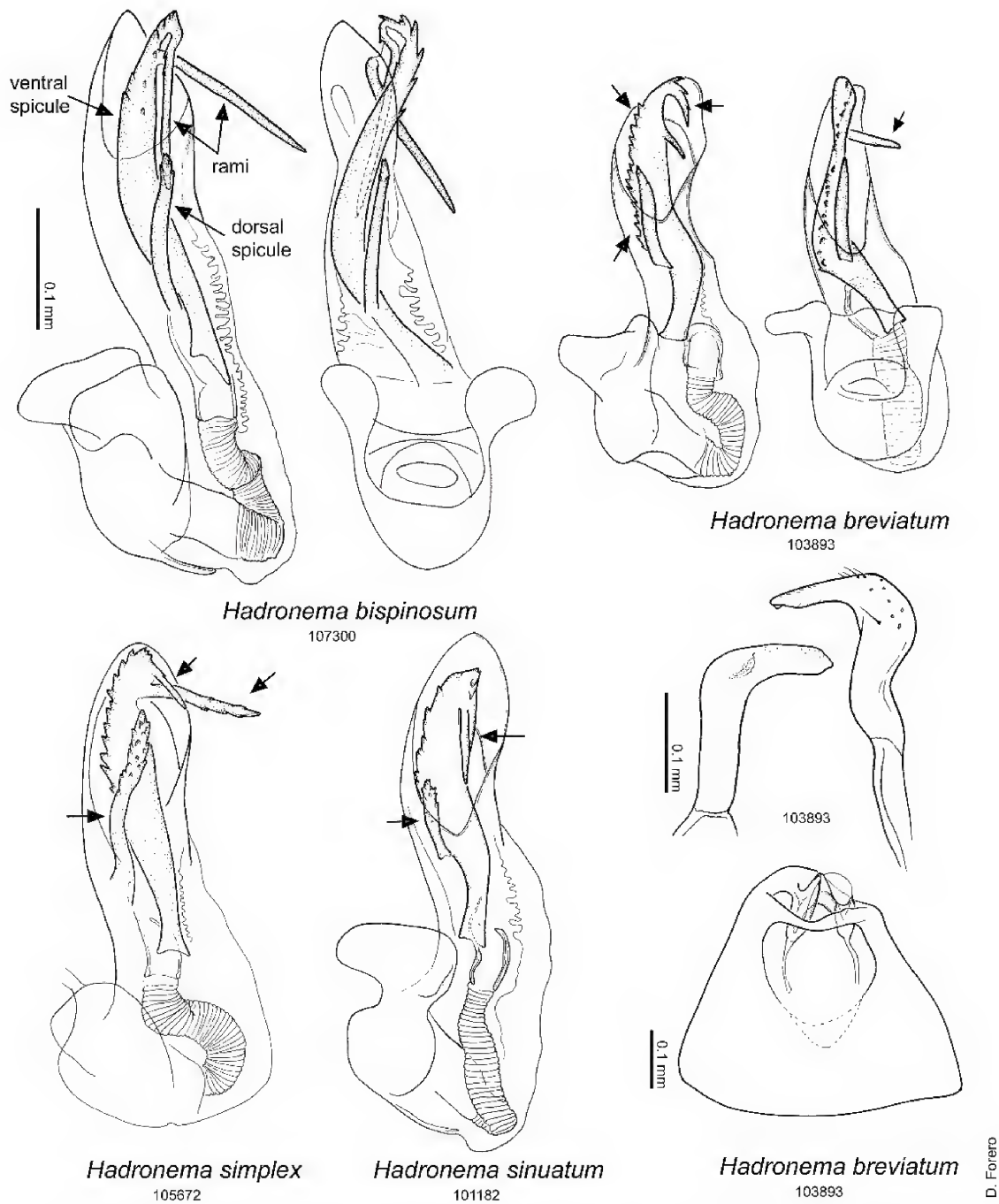

Fig. 26. *Hadronema bispinosum*, *H. breviatum*, *H. simplex*, and *H. sinuatum*. Male genitalia: vesica, lateral left and dorsal views; right and left parameres, dorsomedial and dorsal views, respectively; genital capsule, dorsal view. Arrows indicate species characters (see text for details).

shiny black lines composed of irregular spots, black markings sometimes connected posteriorly, space between markings orange; vertex adjacent to eyes yellow, to some extent longitudinal black markings of frons connected with posterior transverse black band on vertex; broad transverse black band at the base of the head covering transverse carina and adjacent areas, neck black; apex of maxillary plate black; black line connecting base of maxillary and mandibular sutures to antennal socket and eye; labrum shiny black; labial segment I yellow, II yellowish orange, III–IV black; antennae black. THORAX: Pronotum and collar yellowish, sometimes with orange tint; calli black, with scattered black shiny spots, areas around calli weakly orange; posterior lobe ranging from fuscous to bright orange; mesoscutum orange brown; scutellum dark at base, fading to orange medially, disc pale yellow, apex whitish, insertion of setae brown; proepisternum and proepimeron yellowish white, with black spot at base of the propleural suture; mesepisternum, mesepimeron, and metepisternum yellowish white with dorsal margin brown; mesopleural suture pigmented; mesopleural spiracle black; metepisternal scent-gland evaporatory area sometimes pale orange; prosternum yellowish white; mesosternum with two large black spots separated by a thin pale line, sometimes forming a large black spot. *Hemelytra*: Clavus brown, claval suture brown and adjacent areas sometimes whitish; corium yellowish white with a central dark brown spot not reaching costal margin, spot sometimes larger; membrane brown with dark brown veins; a dark brown linear marking on the outer margin of the membrane, posteriad to the cells. *Legs*: Coxae yellowish white; procoxa with two dark spots at base; meso- and metacoxa black at base; trochanters yellowish white, brown at center; femora orange or pale orange with lateral dark spots; basal projection of profemur black; metafemur with preapical black spots, forming a uniform dark ring; protibia pale orange, black at apex, meso- and metatibia black, mesotibia paler at base; tarsi and claws black. ABDOMEN: Tergites brown; sternites yellowish, each sternite with a black spot laterally near anterior margin, sometimes these spots elongate posteriorly almost forming a continuous band. GENITALIA: Genital capsule pale orange on ventral apical surface, with two basal dark spots and one elongate black marking toward ventral right prolongation, sometimes black spots larger, dorsal surface black; parameres brown; proctiger light orange, apex and ventral surface brown. STRUCTURE: THORAX: Metepisternum with evaporatory area rounded on dorsal margin and peritreme large. *Legs*: Profemur with basal process bifid. GENITALIA: Genital capsule subtriangular, without sensory lobe on left side, lateroventral projection on right side of medium size, blunt; supragenital bridge well sclerotized; paramere insertions lateral; left paramere sickle-shaped; apex of right paramere acute but rounded; rami of ventral spicule of vesica thin, subequal in length, long, reaching and surpassing dorsal spicule (fig. 26, arrows); dorsal spicule relatively long, weakly denticulate apically (fig. 26, arrow).

Female: Coloration and structure similar to male, barely broader and longer (fig. 2), total length 3.65–3.68. COLORATION: Subgenital plate dark; ovipositor darkened, at least basally, sometimes paler; dark spot medially on anterior margin of ninth sternite, sometimes surrounded with orange. STRUCTURE: GENITALIA: Subgenital plate triangular, rounded, barely reaching middle of sternite VIII; dorsal lobes of interramal sclerites narrow (fig. 30); central sclerotized area of anterior wall small, transversely divided, dorsal margin with some small tubercles (fig. 33); accessory sclerite of sclerotized rings small, weakly sclerotized (fig. 30).

HOSTS: All known host-plant associations of *H. bispinosum* are with species of Fabaceae: *Dalea multiflora* (as *Petalostemon multiflorum*) (Knight, 1928), *Psoralidium lanceolatum* (as *Psoralea lanceolata*) (Kelton, 1980), *Melilotus indicus*, and "*Psoralea*" sp. A single female specimen was on *Artemisia cana* (Asteraceae).

Hadronema bispinosum has been associated with the meloids *Epicauta andersoni* Werner and *E. ventralis* Werner (Pinto, 1978). The host plants of these two species of *Epicauta* are different (i.e., *Clematis*, *Bassia*, *Solanum*, and *Medicago* for *E. andersoni*; *Bassia*, *Beta*, *Salsola*, *Sarcobatus*, *Medicago*, and *Melilotus* for *E. ventralis* [Pinto, 1991]) from the

recorded ones for *H. bispinosum*, except *Melilotus*, which can be a meloid rather than a mirid host.

DISTRIBUTION: Ranging from Canada (southern Alberta and Saskatchewan) south through the Rocky Mountains to southern Arizona (fig. 36).

DISCUSSION: *Hadronema bispinosum* was described by Knight (1928) as having a bifid process at the base of the front femora in the males, hence its name. Nevertheless, other *Hadronema* species may also have this process bifid (e.g., *H. militare*, fig. 25D), although in some instances small (e.g., *H. pictum*), and it should therefore not be considered diagnostic for *H. bispinosum*.

HOLOTYPE MALE: **USA**: **Wyoming**: ***Crook Co.***: Moorcroft, [44.26331°N 104.9502°W, 1290 m], 31 Jul 1927, H.H. Knight, Holotype (by H.H. Knight) "*Hadronema bispinosa*," H.H. Knight coll. 1976, 1♂ (AMNH_PBI 00070384) (USNM).

PARATYPES: **USA**: **Arizona**: ***Pima Co.***: Tucson, 32.22167°N 110.92583°W, 12 May 1929, E.D. Ball, 1♀ (AMNH_PBI 00107003) (USNM). **Colorado**: ***Larimer Co.***: Fort Collins, 40.58528°N 105.08389°W, 29 Jun 1901, 1♂ (AMNH_PBI 00106884) (USNM). **South Dakota**: ***Lawrence Co.***: Deadwood, 44.37667°N 103.72917°W, 29 Jul 1927, H.H. Knight, 2♀ (AMNH_PBI 00107001, AMNH_PBI 00107002) (USNM). **Wyoming**: ***Big Horn Co.***: Greybull, 44.48912°N 108.0562°W, 1155 m, 16 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00104000) (CNC); 1♀ (AMNH_PBI 00105952) (TAMU); 2♂ (AMNH_PBI 00106888, AMNH_PBI 00106889), 11♀ (AMNH_PBI 00106893–AMNH_PBI 00106897, AMNH_PBI 00106911–AMNH_PBI 00106916) (USNM). ***Crook Co.***: Moorcroft, 44.26331°N 104.9502°W, 1290 m, 31 Jul 1927, H.H. Knight, 21♂ (AMNH_PBI 00106926–AMNH_PBI 00106944, AMNH_PBI 00107303, AMNH_PBI 00107304), 39♀ (AMNH_PBI 00106956–AMNH_PBI 00106993, AMNH_PBI 00107299) (USNM). Sundance, 44.40639°N 104.37528°W, 30 Jul 1927, H.H. Knight, 3♂ (AMNH_PBI 00106885–AMNH_PBI 00106887), 15♀ (AMNH_PBI 00106905–AMNH_PBI 00106910, AMNH_PBI 00106917–AMNH_PBI 00106925) (USNM); 1♀ (AMNH_PBI 00104001) (CNC). ***Sheridan Co.***: Kendrick, 44.72081°N 106.2019°W, 1179 m, 01 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00106955) (USNM). Sheridan, 44.79722°N 106.95556°W, 02 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00125468), 1♀ (AMNH_PBI 00125467) (CUIC); 03 Aug 1927, H.H. Knight, 2♂ (AMNH_PBI 00105949, AMNH_PBI 00105950) (TAMU), 11♂ (AMNH_PBI 00106945–AMNH_PBI 00106954, AMNH_PBI 00107300), 7♀ (AMNH_PBI 00106994–AMNH_PBI 00107000) (USNM).

OTHER SPECIMENS EXAMINED: **CANADA**: **Alberta**: 10 km S of Empress, 50.87683°N 110.01666°W, 10 Aug 1986, C. and A. von Nidek, 1♂ (AMNH_PBI 00190082), 2♀ (AMNH_PBI 00190080, AMNH_PBI 00190081) (ZMAN). Diamond City, 49.8°N 112.85°W, 08 Jul 1956, O. Peck, 3♀ (AMNH_PBI 00104019–AMNH_PBI 00104021) (CNC). Elkwater Park, 49.63°N 110.2°W, 13 Jul 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104005) (CNC); 15 Aug 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00103999) (CNC); 13 Jul 1952, L.A. Konotopetz, 3♀ (AMNH_PBI 00104002–AMNH_PBI 00104004) (CNC); 26 Jul 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104006) (CNC). Irvine, 49.95°N 110.26666°W, 09 Jul 1952, L.A. Konotopetz, 1♀ (AMNH_PBI 00104010) (CNC); 09 Jul 1952, A.R. Brooks, 5♂ (AMNH_PBI 00103990, AMNH_PBI 00103991, AMNH_PBI 00103993–AMNH_PBI 00103995), 3♀ (AMNH_PBI 00104007–AMNH_PBI 00104009) (CNC); 09 Jul 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00103992) (CNC). Lethbridge, 49.7°N 112.83333°W, 05 Jul 1932, R.M. White, 2♀ (AMNH_PBI 00104027, AMNH_PBI 00104028) (CNC). Medicine Hat, 50.03333°N 110.68333°W, 14 Jul 1956, O. Peck, 3♂ (AMNH_PBI 00103996–AMNH_PBI 00103998), 5♀ (AMNH_PBI 00104011–AMNH_PBI 00104015) (CNC); 15 Jul 1956, O. Peck, 1♀ (AMNH_PBI 00104016) (CNC); 14 Jul 1956, E.E. Sterns, 2♀ (AMNH_PBI 00104017, AMNH_PBI 00104018) (CNC); 23 Jul 1930, J.H. Pepper, 3♀ (AMNH_PBI 00104022, AMNH_PBI 00104025, AMNH_PBI 00104026) (CNC); 15 Jul 1929, J.H. Pepper, 1♀ (AMNH_PBI 00104023) (CNC); 13 Jul 1929, J.H. Pepper, 1♀ (AMNH_PBI 00104024) (CNC). **Saskatchewan**: Elbow, 51.11666°N 106.6°W, 08 Aug 1951, A.R. Brooks, *Psoralea* sp. (Fabaceae), 1♂ (AMNH_PBI 00103962) (CNC); 12 Aug 1960, A.R. Brooks, 4♂ (AMNH_PBI 00103964–AMNH_PBI 00103967), 2♀ (AMNH_PBI 00103980, AMNH_PBI 00103981) (CNC); 02 Aug 1951, A.R. Brooks, *Psoralea* sp.

(Fabaceae), 2♂ (AMNH_PBI 00103960, AMNH_PBI 00103961), 4♀ (AMNH_PBI 00103972–AMNH_PBI 00103975) (CNC); 28 Jul 1951, L.A. Konotopetz, *Psoralea* sp. (Fabaceae), 1♂ (AMNH_PBI 00103963), 2♀ (AMNH_PBI 00103982, AMNH_PBI 00103983) (CNC); 02 Aug 1951, L.A. Konotopetz, *Psoralea* sp. (Fabaceae), 4♀ (AMNH_PBI 00103976–AMNH_PBI 00103979) (CNC). Gascoigne, 50.73°N 109.78°W, 23 Aug 1957, A.R., J.E. Brooks, 2♀ (AMNH_PBI 00103969, AMNH_PBI 00103970) (CNC). Great Sand Hills, 50.5°N 109.08333°W, 04 Jul 1952, A.R. Brooks, *Psoralea* sp. (Fabaceae), 2♂ (AMNH_PBI 00103949, AMNH_PBI 00103950), 2♀ (AMNH_PBI 00103954, AMNH_PBI 00103955) (CNC); 04 Jul 1952, L.A. Konotopetz, *Psoralea* sp. (Fabaceae), 3♂ (AMNH_PBI 00103951–AMNH_PBI 00103953), 4♀ (AMNH_PBI 00103956–AMNH_PBI 00103959) (CNC). Tunstall, 50.15°N 109.78°W, 25 Aug 1938, A.P. Arnason, 1♀ (AMNH_PBI 00103968) (CNC). **USA**: **Arizona**: ***Coconino Co.***: 3 mi N of Flagstaff, 35.24158°N 111.65056°W, 10 Jun 1974–15 Jun 1974, J.D. Pinto, 1♂ (AMNH_PBI 00101187), 1♀ (AMNH_PBI 00101201) (AMNH). 6♀ (AMNH_PBI 00083537–AMNH_PBI 00083542) (UCR); 20 Jun 1973–30 Jun 1973, J.D. Pinto, 5♂ (AMNH_PBI 00083522–AMNH_PBI 00083526), 1♀ (AMNH_PBI 00083527) (UCR). Coconino County, 35.99444°N 112.1975°W, 01 Jul 1929, L.D. Anderson, 9♂ (AMNH_PBI 00075206, AMNH_PBI 00075207, AMNH_PBI 00075219–AMNH_PBI 00075225), 11♀ (AMNH_PBI 00075212, AMNH_PBI 00075227–AMNH_PBI 00075236) (KU); 01 Jul 1929, P.W. Oman, 2♂ (AMNH_PBI 00075208, AMNH_PBI 00075226), 1♀ (AMNH_PBI 00075215) (KU); 01 Jul 1929, R.H. Beamer, 1♂ (AMNH_PBI 00075209), 2♀ (AMNH_PBI 00075213, AMNH_PBI 00075214) (KU). Flagstaff, 35.19806°N 111.65056°W, 2134 m, 14 Jul 1947, L.D. Beamer, 1♀ (AMNH_PBI 00075211) (KU). **Colorado**: ***Arapahoe Co.***: Englewood, 39.64778°N 104.98722°W, 08 Jul 1979, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065306) (JTP). ***Baca Co.***: Springfield, 37.40833°N 102.61389°W, 18 Jun 1988, R. Wharton and B. Mann, 2♀ (AMNH_PBI 00105606, AMNH_PBI 00105607) (TAMU). ***Boulder Co.***: Longs Peak trail, Hudsonian zone, 40.2722°N 105.6005°W, 3575 m, collector unknown, 1♀ (AMNH_PBI 00101206) (AMNH). ***Clear Creek Co.***: Doolittle Ranch, Mount Evans, 39.67528°N 105.60056°W, 2987 m, 09 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00103986) (CNC); 21 Jul 1961, B.H. Poole, 2♀ (AMNH_PBI 00103987, AMNH_PBI 00103988) (CNC). Echo L. 10, Mount Evans, 39.65832°N 105.60333°W, 183 m, 13 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00103984), 1♀ (AMNH_PBI 00103989) (CNC). Mount Evans, 39.58°N 105.6°W, 3962 m, 25 Jul 1961, C.H. Mann, 1♂ (AMNH_PBI 00103985) (CNC). ***Denver Co.***: Denver, 39.73917°N 104.98417°W, 01 Jul 1922, Stoner, 1♂ (AMNH_PBI 00070628) (USNM). ***Douglas Co.***: Chatfield State Park, 39.53666°N 105.06888°W, 03 Jun 1992, J.T. Polhemus, 1♀ (AMNH_PBI 00065405) (JTP). Head of Highline Canal, 39.56168°N 104.99692°W, 16 Jun 1978, J.T. Polhemus, 2♀ (AMNH_PBI 00065300, AMNH_PBI 00065301) (JTP); 20 Jun 1978, J.T. Polhemus, 3♀ (AMNH_PBI 00065297–AMNH_PBI 00065299) (JTP); 03 Aug 1979, J.T. Polhemus, 1♀ (AMNH_PBI 00065395) (JTP). Perry Park, 39.25667°N 104.99194°W, 27 Jul 1977, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065308) (JTP). Roxborough Park Road near Chatfield State Park, 39.47389°N 105.08472°W, 1707 m, 06 Jul 1981, J.T. Polhemus, 1♂ (AMNH_PBI 00065404), 1♀ (AMNH_PBI 00065406) (JTP). Waterton, 39.49361°N 105.08806°W, 02 Jul 1981, J.T. Polhemus, 3♀ (AMNH_PBI 00065407–AMNH_PBI 00065409) (JTP); 01 Jul 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065295), 1♀ (AMNH_PBI 00065296) (JTP); 18 Jun 1981, D.A. Polhemus, 4♀ (AMNH_PBI 00065391, AMNH_PBI 00065393, AMNH_PBI 00065394, AMNH_PBI 00065410) (JTP); 04 Jun 1981, D.A. Polhemus, 1♀ (AMNH_PBI 00065392) (JTP); 15 Jun 1981, D.A. Polhemus, 2♂ (AMNH_PBI 00065414, AMNH_PBI 00065415), 1♀ (AMNH_PBI 00065416) (JTP). ***El Paso Co.***: Colorado Springs, 38.83389°N 104.82083°W, 1803 m, O. Heidemann, 2♂ (AMNH_PBI 00125469, AMNH_PBI 00125470) (CUIC). ***Elbert Co.***: 5 mi E of Agate, 39.46167°N 103.84804°W, 06 Jul 1979, D.A. Polhemus, 1♀ (AMNH_PBI 00065305) (JTP). Wolf Creek, 10 mi NE of Kiowa, 39.45213°N 104.39879°W, 05 Jul 1979, D.A. Polhemus, 1♂ (AMNH_PBI 00065389), 3♀ (AMNH_PBI 00065302–AMNH_PBI 00065304) (JTP). ***Morgan Co.***: 8 mi NW Snyder, 40.41111°N 103.70337°W, 08 Jun 1989, P.A. Opler,

Melilotus indicus (Fabaceae), 1♀ (AMNH_PBI 00079861) (UCB). ***Saguache Co.***: Great Sand Dunes NationalMonument, 37.75444°N 105.5591°W, 2316 m, 24 Jul 1968, E.C. Becker, 1♀ (AMNH_PBI 00103904) (CNC). ***Weld Co.***: Stoneham, 40.60553°N 103.6666°W, 1397 m, 09 Jul 1964, H.H. Knight, 2♂ (AMNH_PBI 00106891, AMNH_PBI 00106892), 3♀ (AMNH_PBI 00106902–AMNH_PBI 00106904) (USNM). ***Yuma Co.***: Hale Ponds, 6 mi NE of Hale, 39.6508°N 102.05354°W, 10 Jul 1987, J.T. Polhemus, 1♀ (AMNH_PBI 00065307) (JTP). Unknown locality, 1♀ (AMNH_PBI 00106901) (USNM). **Nebraska**: ***Sioux Co.***: Glen, 42.6075°N 103.58388°W, 1237 m, Aug 1906, collector unknown, 2♀ (AMNH_PBI 00106899, AMNH_PBI 00106900) (USNM). **North Dakota**: ***Bowman Co.***: 1 mi W of Marmarth and 1 mi S route 12, 46.2833°N 103.9333°W, 26 Jun 2000, T.J. Henry, *Artemisia cana* Pursh (Asteraceae), silver sage brush, 1♀ (AMNH_PBI 00165827) (USNM). **South Dakota**: ***Pennington Co.***: Hill City, 43.93248°N 103.5751°W, 1519 m, Jun 1891, O. Heidemann, 1♀ (AMNH_PBI 00125472) (CUIC). Rapid City, 44.08055°N 103.23111°W, 988 m, 24 Jun 1923, H.C. Severin, 1♂ (AMNH_PBI 00106890) (USNM). Wasta, 44.06859°N 102.4457°W, 707 m, 17 Jul 1937, C.L. Johnston, 1♂ (AMNH_PBI 00075248) (KU). **Utah**: ***Juab Co.***: Eureka, 39.95411°N 112.1202°W, 1964 m, 30 Jul 1957, A.H. Barnum, 1♂ (AMNH_PBI 00105951) (TAMU). ***Millard Co.***: Lynndyl, 39.51911°N 112.3757°W, 1459 m, 24 Jun 1927, G.F. Knowlton, 1♀ (AMNH_PBI 00103903) (CNC). ***San Juan Co.***: Moki Canyon near Halls Crossing, 37.71277°N 110.71277°W, 1174 m, 02 Apr 1982, D.A. and J.T. Polhemus, 4♂ (AMNH_PBI 00065338–AMNH_PBI 00065340, AMNH_PBI 00065390), 2♀ (AMNH_PBI 00065341, AMNH_PBI 00065342) (JTP). Rim of Moki Canyon near Halls Crossing, 37.45694°N 110.71222°W, 1219 m, 28 May 1978, D.A. and J.T. Polhemus, 6♀ (AMNH_PBI 00065343–AMNH_PBI 00065348) (JTP). **Wyoming**: ***Niobrara Co.***: Whitman, 42.88774°N 104.1149°W, 1348 m, collector unknown, 1♀ (AMNH_PBI 00101203) (AMNH); 02 Aug 1943, Ptadt, 1♀ (AMNH_PBI 00101205) (AMNH). ***Park Co.***: Powell, 44.75389°N 108.75667°W, 20 Jun 1936, collector unknown, 1♀ (AMNH_PBI 00101204) (AMNH). ***Platte Co.***: Wheatland, 42.05444°N 104.95222°W, 14 Jul 1937, C.L. Johnston, 1♂ (AMNH_PBI 00075210) (KU). ***Sheridan Co.***: Big Horn, 44.6833°N 106.9922°W, 1240 m, 09 Jul 1896, R.P. Currie, 1♀ (AMNH_PBI 00106898) (USNM).

Hadronema breviatum Knight
Figures 2, 26, 30, 33, 35

Hadronema (*Hadronema*) *breviata* Knight, 1928: 177 [n. sp.]; Carvalho, 1958: 68 [catalog].
Hadronema breviatum: Steyskal, 1973: 207 [emendation].
Hadronema (*Hadronema*) *breviatum*: Henry and Wheeler, 1988: 411 [catalog].
Hadronema breviata: Schuh, 1995: 115 [catalog].

DIAGNOSIS: Recognized by the short antennal segment II, not equal to head width (table 1); the small total length (table 1); the unequal length of the rami of the vesical ventral spicule, with their insertion wide apart (fig. 26, arrows); the longer area of denticles on the dorsal margin of the ventral spicule (fig. 26, arrows); and the rather short dorsal lobes of the interramal sclerites on the posterior wall (fig. 30).

Hadronema breviatum is distinguished from the remaining *Hadronema* species by the short antennal segment II, which is shorter than head width, the short total body length (table 1), and by the unequal length of the rami with their insertions wide apart (fig. 26). Females of *H. pictum* may have a shorter antennal segment II relative to head width (table 1), but the ratio of antennal segments II/III is larger than in *H. breviatum*, and the total body length is larger (table 1). Females of *H. simplex* have a similar coloration, but *H. breviatum* specimens are smaller. Association with males will give unambiguous identifications for this species.

REDESCRIPTION: *Male*: Small, total length 2.60–2.78. COLORATION (fig. 2): Dark brown with pale areas on hemelytra and pronotum. HEAD: Black; clypeus with three longitudinal areas of irregular shiny spots; frons with two longitudinal areas of oblique, irregular, shiny black lines; mandibular and maxillary plates reddish black; black line connecting bases of mandibular and maxillary plates with antennal socket and eye; labrum shiny black; labium darkening distally; antennae dark brown. THORAX: Collar and pronotum dark brown, calli black with

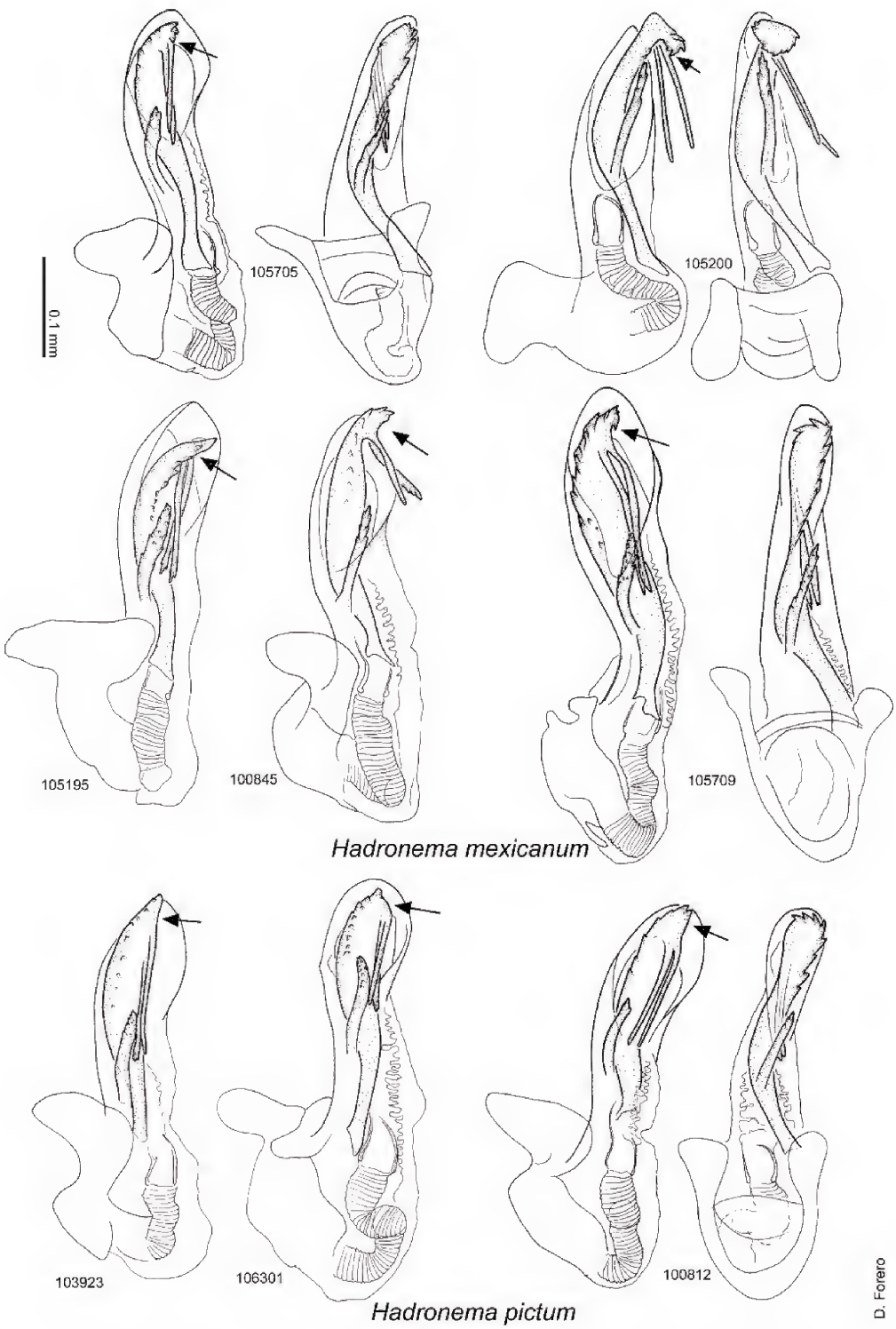

Fig. 27. *Hadronema mexicanum* and *H. pictum*. Male genitalia: vesica, lateral left and dorsal views, showing variation across geographic range. Arrows indicate species characters (see text for details).

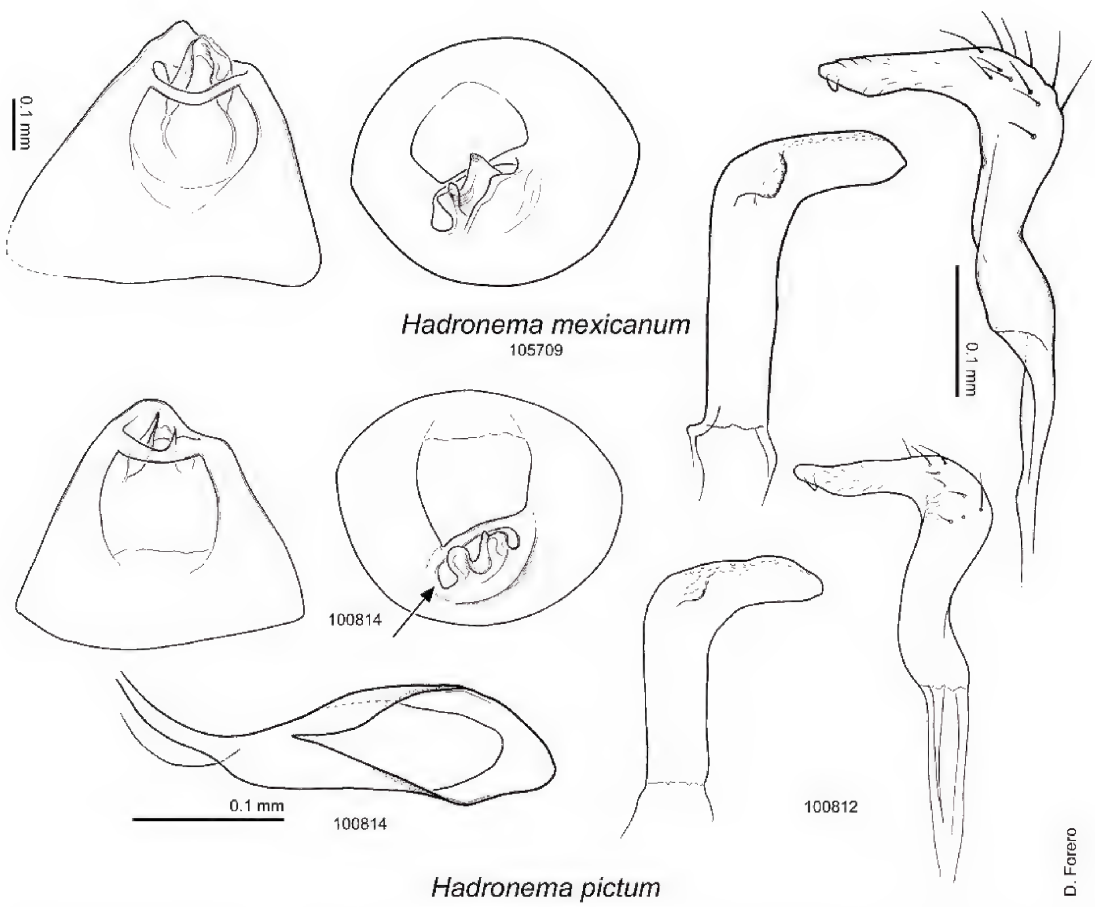

Fig. 28. *Hadronema mexicanum* and *H. pictum*. Male genitalia: right and left parameres, dorsomedial and dorsal views, respectively; genital capsule, dorsal and posterior views; phallotheca, lateral left view. Arrow indicates insertion of left paramere.

shiny areas, posterior margin of pronotum pale; mesoscutum and scutellum black, latter apically whitish; proepisternum black; proepimeron anteriorly black, posteriorly whitish; mesepisternum and mesepimeron black with suture dark; mesothoracic spiracle black; metepisternum reddish brown. *Hemelytra*: Clavus dark brown; corium pale brown with a central dark brown spot, embolium whitish; cuneus white with inner margin dark brown; membrane brown with veins dark brown. *Legs*: Black; basal portion of trochanters pale. ABDOMEN: Black, posterior margin of sternites whitish. GENITALIA: Genital capsule black; proctiger pale; parameres brown. STRUCTURE: THORAX: Metepisternum with evaporatory area reduced. *Legs*: Basal process of profemur weakly bifid, lateral tubercle small. GENITALIA: Genital capsule subtriangular, without sensory lobe, latero-ventral projection on right side small, blunt; paramere insertions lateral; left paramere sickle-shaped; right paramere acute apically; ventral spicule with denticles on its distal two-thirds of dorsal margin, rami unequal in length, separated from each other almost by the length of the outermost ramus (fig. 26, arrows); dorsal spicule about a third the length of ventral, barely denticulate apically (fig. 26, arrow).

Female: Coloration and structure similar to male; broader, barely larger (fig. 2), total length 2.83–3.21. STRUCTURE: GENITALIA: Subgenital plate triangular, rounded apically, barely reaching sternite VIII; dorsal lobes of interramal sclerites short and small, with few

microtrichia (fig. 30); central sclerotized area of anterior wall small, transversely divided, central tubercle relatively large and well sclerotized, dorsal margin denticulate (fig. 33); dorsal labiate plate with sclerotized rings weakly sclerotized, without accessory sclerites (fig. 30).

DISTRIBUTION: Ranging from Canada (southern Alberta) south to Arizona west of 100th meridian (fig. 35).

HOSTS: One specimen was found on *Artemisia tridentata* (Asteraceae) and another on an unidentified species of Fabaceae. Young (1984b) listed *H. breviatum* from California associated with cantharidin traps. I have not been able to examine those specimens to confirm the species identification. No further biological information is known for this taxon.

DISCUSSION: *Hadronema breviatum* is known only from a few specimens. Although the distribution of this taxon is wide, collecting efforts have failed to produce longer series. The only recorded plant species may not be a true breeding record. The Miridae fauna of *A. tridentata* is well known (e.g., Schuh, 2004), and it is unlikely that this species has been missed when collecting other Miridae species.

Specimens mentioned by Knight (1928) from Orderville (Utah) were not examined. The locality of one of the paratypes, "Kaibab Forest, rim of Grand Canyon", is in Arizona, not Utah, as listed by Knight (1928). Specimens of *H. breviatum* mentioned by Carvalho and Afonso (1977) as from Mexico (Jalisco) are in fact *H. mexicanum* (see below).

HOLOTYPE MALE: **USA**: **Wyoming**: ***Park Co.***: Yellowstone National Park, [44.76667°N 110.23333°W], 20 Jul 1920–25 Jul 1920, A.A. Nichol, Holotype (by H.H. Knight) "*Hadronema breviatus*" (sic), H.H. Knight coll. 1976, 1♂ (AMNH_PBI 00070385) (USNM).

PARATYPES: **USA**: **Arizona**: ***Coconino Co.***: Kaibab Point, 36.1984°N 112.05274°W, 25 Aug 1926, A.A. Nichol, 2♀ (AMNH_PBI 00103640, AMNH_PBI 00103640) (CNC). 1♀ (AMNH_PBI 00106623) (USNM). Rim of Grand Canyon, Kaibab Forest, 35.956°N 111.966°W, 01 Jul 1927, V.M. Tanner, 2♀ (AMNH_PBI 00106622, AMNH_PBI 00106624) (USNM).

OTHER SPECIMENS EXAMINED: **CANADA**: **Alberta**: Elkwater, 49.63°N 110.2°W, 05 Jun 1952, L.A. Konotopetz, 2♀ (AMNH_PBI 00104595, AMNH_PBI 00104596) (CNC). Elkwater Park, 49.63°N 110.2°W, 13 Jul 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00103893) (CNC). Glenwood, 49.36666°N 113.51666°W, 01 Jul 1939, R.W. Salt, (Fabaceae), 1♀ (AMNH_PBI 00104598) (CNC). Irvine, 49.95°N 110.26666°W, 11 Jun 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104599) (CNC). Manyberries, 49.4°N 110.7°W, 03 Jun 1952, A.R. Brooks, 1♂ (AMNH_PBI 00103892) (CNC). Onefour, 49.06666°N 110.45°W, 14 Jun 1952, L.A. Konotopetz, 1♀ (AMNH_PBI 00104597) (CNC). **USA**: **Nevada**: ***Eureka Co.***: Garden Summit on Rt 278, 23.5 mi N of Eureka at Rt 50, 39.84109°N 116.16276°W, 1981 m, 27 Jun 1983, R.T. Schuh and M.D. Schwartz, *Artemisia tridentata* (Asteraceae), 1♀ (AMNH_PBI 00101160) (AMNH). **South Dakota**: ***Haakon Co.***: Philip, 44.03943°N 101.6651°W, 660 m, 23 Jun 1923, H.C. Severin, 1♀ (AMNH_PBI 00107028) (USNM). **Washington**: ***Yakima Co.***: Mount Adams, 46.22037°N 121.4687°W, 03 Aug 1930, A.R. Rolfs, 1♀ (AMNH_PBI 00106759) (USNM).

Hadronema incognitum, sp. nov.
Figures 2, 29, 32, 34, 36

DIAGNOSIS: Recognized by the relatively large size (table 1); the metathoracic scent-gland evaporatory area strongly reduced; the genital capsule subquadrangular (fig. 29), with the ventral right prolongation long (fig. 29, arrow); the insertion of left paramere on genital capsule nearly ventral; the left paramere weakly sinuate, gently curved before the apex (fig. 29, arrow); and females with subgenital plate long, broadly truncate apically (fig. 34), almost reaching posterior margin of eighth sternum.

Hadronema incognitum is distinguished from other species of *Hadronema*, except *H. militare*, by the subquadrangular genital capsule, relative large size, and weakly sinuate left paramere. *Hadronema incognitum* is similar to *H. militare* in coloration, size, and structure, but can be easily separated from it by the rather gently curved left paramere at the apex (fig. 29), and by not

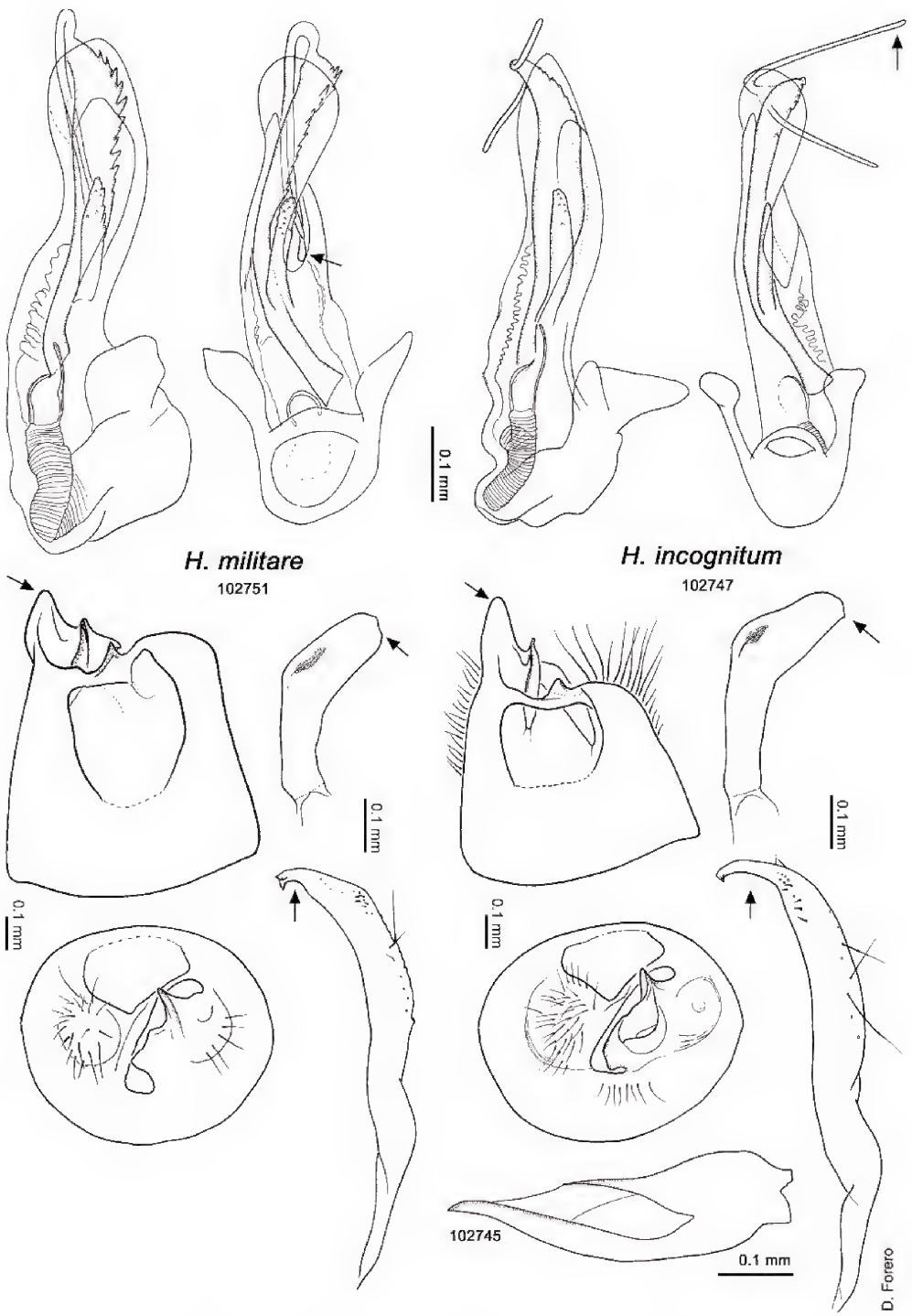

Fig. 29. *Hadronema militare* and *H. incognitum*. Male genitalia: vesica, lateral right and dorsal views; genital capsule, dorsal and posterior views; right and left parameres, dorsomedial and dorsal views, respectively; phallotheca, dorsal view. Genital capsule of *H. militare* not showing chaetotaxia. Arrows indicate species characters (see text for details).

having the rami clubbed (fig. 29, arrow). *Hadronema incognitum* is also slightly smaller than *H. militare* (table 1).

DESCRIPTION: *Male*: Large, total length 3.73–4.17. COLORATION: Black with red and whitish markings (fig. 2). HEAD: Black, clypeus with two lateral and one basal longitudinal irregular shiny black marking; frons with two longitudinal areas of irregular oblique shiny black lines; two shiny black areas in front of ocular ridge next to eyes; suture between mandibular and maxillary plates shiny black, apex of mandibular plate reddish black; labrum black, shiny; labium black, segments III–IV shiny black; antennae pitch black. THORAX: Pronotum and collar black, anterior margin sometimes reddish black; calli black with scattered irregular shiny areas; posterior lobe mostly black, fading to red posteriorly, posterior margin whitish; mesoscutum reddish black, laterally more strongly red; scutellum black, sometimes apically pale; proepisternum black; proepimeron with anterior half black, sometimes reddish black, posterior half reddish orange, ventroposterior margin pale; mesepisternum and mesepimeron black; metepisternum black, weakly reddish black on center; venter black. *Hemelytra*: Clavus black; corium mostly black, costal margin and adjacent area white; cuneus white on lateral half; area between corium and membrane shiny black; membrane fuscous, veins dark brown. *Legs*: Black. ABDOMEN: Black, membrane of dorsal margin of sternites orange, posterior margin weakly pale. GENITALIA: Genital capsule black; proctiger bright orange, ventrally and apically brown; left paramere brownish black, apically brown; right paramere brown. STRUCTURE: THORAX: Metepisternum with evaporatory area reduced and peritreme greatly enlarged. *Legs*: Profemur with large basal ventral process, bifid. GENITALIA (fig. 29): Genital capsule subquadrangular, apparently cleft in ventral view, left side posteriorly rounded and beset with numerous long setae forming a sensory lobe, right side with a long posteriad prolongation; supragenital bridge heavily sclerotized; left paramere insertion almost ventral, nearly straight, weakly sinuate, gently curved before apex, with two apical small processes apically, one directed ventrad; right paramere with a small acute process apically; rami of ventral spicule of subequal length, anterior one shorter, posterior one barely longer, both rami approximately of same width, not clubbed at the apex; dorsal spicule denticulate on apical third, about a third the length of ventral spicule.

Female: Similar in coloration and structure to male (fig. 2), but larger and more strongly oval, total length 4.36–5.01. STRUCTURE: GENITALIA: Subgenital plate subrectangular, long, almost reaching posterior margin of sternite VIII, apex broadly truncate (fig. 34); dorsal lobes of interramal sclerites narrow, of medium size (fig. 32); central sclerotized area on posterior wall heavily sclerotized, trapezoidal, not divided transversely, medial posteriorly directed tubercle prominent, bearing numerous small tubercles, dorsal margin of sclerotized area with small denticles (fig. 34); sclerotized rings as in figure 32.

DISTRIBUTION: *Hadronema incognitum* is restricted to California and Oregon, ranging from the Cascades and Sierra Nevada west to the Coast Range (fig. 36).

HOSTS: *Hadronema incognitum* has been found mostly associated with *Lupinus adsurgens*, several unidentified species of *Lupinus* (Fabaceae), and *Senecio* sp. (Asteraceae). A few specimens were found on *Vicia* sp. (Fabaceae). Two specimens associated with *Phacelia hastata* (Hydrophyllaceae) may be sitting records. Some specimens (e.g., AMNH_PBI 00102745) were also found on *Lupinus* plants with Meloidae. This is consistent with reports of associations with Meloidae for other species of *Hadronema* (Pinto, 1978; Young, 1984a, 1984b).

ETYMOLOGY: The species is named from the Latin adjective "incognitus", meaning not known, and refers to the fact that this new species was unnoticed in collections under "*H. militare*".

DISCUSSION: *Hadronema incognitum* has been confused in collections with *H. militare*. It not only shares with *H. militare* a similar coloration, relative large size, and male genitalic structures, but also similar host-plant associations. Nevertheless, characters on the genital capsule and left paramere (see above) support its status as a new species.

Hadronema incognitum and *H. militare* do not overlap in their range, although they are both present in Modoc County, California. It is not known if they concur in other peripheral areas of their distributional range. *Hadronema militare* is widely distributed, whereas *H. incognitum* is restricted to California and Oregon. This restricted western distribution is similar to what is found for instance in *Slaterocoris solidaginis* Kelton (Kelton, 1968), *Squamocoris fumosus* Stonedahl and Schuh (Stonedahl and Schuh, 1986), *Lopidea marginata* Uhler (Asquith, 1991) (Miridae: Orthotylinae), and several species of *Oligotylus* (Schuh, 2000a) (Miridae: Phylinae). Disjunct distributional patterns between sister groups, like *H. incognitum* and *H. militare*, are common in Miridae, as in the case of *Ceratopsallus* and *Bisulcopsallus* (Schuh, 2006).

HOLOTYPE MALE: **USA**: **Oregon**: ***Jackson Co.***: Siskiyou Summit on I-5, [42.075°N 122.60583°W], 1311 m, 04 Jul 1982, G.M. Stonedahl and T.J. Henry, *Lupinus* sp. (Fabaceae), Holotype *Hadronema incognitum*, n. sp. D. Forero (red label), 1♂ (AMNH_PBI 00100501) (AMNH).

PARATYPES: **USA**: **California**: ***Kern Co.***: 10–20 mi S of Isabella Lake, 35.42°N 118.53°W, 28 Apr 1969, J. Schuh, 5♂ (AMNH_PBI 00100631–AMNH_PBI 00100635), 5♀ (AMNH_PBI 00100644–AMNH_PBI 00100648) (AMNH). 3 mi NE of Havilah, 35.54854°N 118.47997°W, 15 May 1963, S.W. Earnshaw, 1♂ (AMNH_PBI 00079953) (UCB). S of Tehachapi on Water Canyon Rd, 35.08017°N 118.4954°W, 1590 m, 21 May 2004, Schuh, Cassis, Schwartz, Weirauch, Wyniger, Forero, *Lupinus adsurgens* E. Drew (Fabaceae), det. A. Sanders UCR 140618, 3♂ (AMNH_PBI 00102057–AMNH_PBI 00102059), 4♀ (AMNH_PBI 00102060–AMNH_PBI 00102063) (AMNH). ***Los Angeles Co.***: 0.9 mi W of Wrightwood on Rt 2, 34.36083°N 117.64826°W, 2030 m, 30 Jun 1980, R.T. Schuh, *Lupinus* sp. (Fabaceae) with Meloidae, 2♂ (AMNH_PBI 00100547, AMNH_PBI 00102745), 15♀ (AMNH_PBI 00100548–AMNH_PBI 00100561, AMNH_PBI 00102796) (AMNH). ***Mariposa Co.***: El Portal, 37.67472°N 119.78306°W, 18 May 1938, N.A. Olson, 1♂ (AMNH_PBI 00079990) (UCB). Mariposa County, 37.485°N 119.96528°W, 23 May 1938, N.A. Olson, 1♂ (AMNH_PBI 00079989), 1♀ (AMNH_PBI 00079998) (UCB). ***Mendocino Co.***: 5 mi N of Branscomb, 39.72589°N 123.62444°W, 24 May 1976–25 May 1976, W. Middlekauff, 1♂ (AMNH_PBI 00079955) (UCB). ***Modoc Co.***: Buck Creek Ranger Station, 41.8717°N 120.30075°W, 08 Jun 1970–10 Jun 1970, J. Powell, 1♂ (AMNH_PBI 00079991) (UCB). ***Monterey Co.***: 1.5 mi SW of Arroyo Seco Guard Station, Horse Bridge, 36.31222°N 121.29682°W, 396 m, 06 May 1975, J.A. Powell, 1♂ (AMNH_PBI 00079813) (UCB). ***Plumas Co.***: 4 mi W of Quincy, 39.93694°N 121.02152°W, 07 Jul 1949, D. Cox, 1♂ (AMNH_PBI 00079954), 4♀ (AMNH_PBI 00079962–AMNH_PBI 00079965) (UCB). ***San Diego Co.***: Conservation Camp road, 34.76666°N 115.63333°W, 367 m, 19 May 1998, J.L. Mottern, 1♂ (AMNH_PBI 00083464) (UCR). ***San Luis Obispo Co.***: 10 mi S of Creston, 35.37384°N 120.52278°W, 01 May 1962, J.A. Powell, 1♂ (AMNH_PBI 00079821) (UCB). ***Tulare Co.***: 4 mi N of Kaweah, 36.52773°N 118.9175°W, 13 May 1963, S.W. Earnshaw, 6♂ (AMNH_PBI 00079956–AMNH_PBI 00079961), 3♀ (AMNH_PBI 00079966–AMNH_PBI 00079968) (UCB). 8 mi SE of Fountain Springs, 35.80902°N 118.81344°W, 28 Mar 1974, J.D. Pinto, 1♂ (AMNH_PBI 00083461) (UCR). Woodlake, 36.41361°N 119.09778°W, 24 Apr 1932, E.P. Van Duzee, 1♂ (AMNH_PBI 00106625) (USNM). ***Tuolumne Co.***: Mather, 37.88214°N 119.8557°W, 1378 m, 04 Jul 1932, E.C. Zimmerman, 1♂ (AMNH_PBI 00106643), 2♀ (AMNH_PBI 00106644, AMNH_PBI 00106645) (USNM). Near Mather, 37.88214°N 119.8557°W, 21 Jul 1928, R.L. Usinger, 1♂ (AMNH_PBI 00079988), 6♀ (AMNH_PBI 00079992–AMNH_PBI 00079997) (UCB); 10 Jul 1930–31 Jul 1930, E. Zimmermann, 8♂ (AMNH_PBI 00079969–AMNH_PBI 00079976), 11♀ (AMNH_PBI 00079977–AMNH_PBI 00079987) (UCB). **Oregon**: ***Jackson Co.***: 0.5 mi E of Pinehurst, 42.11778°N 122.35525°W, 1082 m, 27 Jun 1979, M.D. Schwartz, *Lupinus* sp. (Fabaceae), 7♂ (AMNH_PBI 00100602–AMNH_PBI 00100607, AMNH_PBI 00102747), 10♀ (AMNH_PBI 00100619–AMNH_PBI 00100628) (AMNH). 0.5 mi S of Siskiyou Summit on Old Rt 99, Old Siskiyou Rd, 42.06777°N 122.60583°W, 1346 m, 26 Jun 1979, R.T. and Joe Schuh, *Lupinus* sp. (Fabaceae), 10♂ (AMNH_PBI 00100511–AMNH_PBI 00100520), 26♀ (AMNH_PBI 00100521–AMNH_PBI 00100546)

(AMNH); 27 Jun 1979, R.T. and Joe Schuh, 4♂ (AMNH_PBI 00100637–AMNH_PBI 00100640), 6♀ (AMNH_PBI 00100649–AMNH_PBI 00100654) (AMNH). Shady Cove, 42.61068°N 122.8125°W, 427 m, 23 Jun 1977, J. Schuh, 1♂ (AMNH_PBI 00100630), 1♀ (AMNH_PBI 00100643) (AMNH). Siskiyou Summit on I-5, 42.075°N 122.60583°W, 1311 m, 04 Jul 1982, G.M. Stonedahl and T.J. Henry, *Lupinus* sp. (Fabaceae), 11♂ (AMNH_PBI 00100495–AMNH_PBI 00100500, AMNH_PBI 00100502–AMNH_PBI 00100506), 4♀ (AMNH_PBI 00100507–AMNH_PBI 00100510) (AMNH); 05 Jul 1982, T.J. Henry and G.M. Stonedahl, *Vicia* sp. (Fabacaeae), 6♂ (AMNH_PBI 00165776–AMNH_PBI 00165781), 6♀ (AMNH_PBI 00165784–AMNH_PBI 00165789); *Phacelia hastata* (Hydrophyllaceae), 2♂ (AMNH_PBI 00165782, AMNH_PBI 00165783) (USNM). Siskiyou Summit, Old Road, 42.075°N 122.60583°W, 1260 m, 22 Jul 1999, Schwartz, Gillespie, Quiring, 4♂ (AMNH_PBI 00103876–AMNH_PBI 00103879), 12♀ (AMNH_PBI 00103880–AMNH_PBI 00103891) (CNC). Siskiyou Summit, Old Siskiyou Hwy and Frontage Rd, 42.075°N 122.60583°W, 1314 m, 01 Jul 1994, M.D. Schwartz, 1♀ (AMNH_PBI 00103843) *Lupinus* sp. (Fabaceae), 24♂ (AMNH_PBI 00103804–AMNH_PBI 00103827), 10♀ (AMNH_PBI 00103828–AMNH_PBI 00103837) (CNC). Just E of Pinehurst, 42.11778°N 122.365°W, 1340 m, 27 Jun 1979, R.T. and Joe Schuh, 1♂ (AMNH_PBI 00100629), 2♀ (AMNH_PBI 00100641, AMNH_PBI 00100642) (AMNH). ***Lake Co.***: Summer Lake, 42.82786°N 120.79559°W, 16 Aug 1939, J. Schuh, 1♂ (AMNH_PBI 00100636) (AMNH). ***Linn Co.***: 1 mi N Frissel Point, HJ Andrews Experimental Forest, 44.27127°N 122.20091°W, 28 Jul 1981, G. Stonedahl, *Senecio* sp. (Asteraceae), 16♂ (AMNH_PBI 00100562–AMNH_PBI 00100572, AMNH_PBI 00100608–AMNH_PBI 00100612), 34♀ (AMNH_PBI 00100573–AMNH_PBI 00100600, AMNH_PBI 00100613–AMNH_PBI 00100618); *Senecio* sp. (Asteraceae), 1♂ (AMNH_PBI 00102746) (AMNH).

Hadronema mexicanum, sp. nov.
Figures 2, 27, 28, 30, 33

Hadronema militaris: Distant, 1883: 259 [misidentification?, distribution]; Reuter, 1908 [misidentification?, distribution].

Hadronema breviata: Carvalho and Afonso, 1977: 9 [misidentification, distribution].

DIAGNOSIS: Recognized by the curved fuscous marking on the anterior portion of the posterior lobe of the pronotum (fig. 2); the ventral spicule apically decurved in lateral view (fig. 27, arrows); and the slender subequal rami that reach the dorsal spicule.

Hadronema mexicanum is mostly similar to *H. pictum* due to the bright red posterior lobe of the pronotum but separated from it by the apically decurved left spicule and the greater ratio of antennal segments II/III (table 1). Pale specimens of *H. mexicanum* may be confused with *H. simplex* but are easily separated from it by the normally developed evaporatory area on the metepisternum, which is reduced in *H. simplex*, and by the long subequal rami, which are unequal in *H. simplex* (fig. 26).

DESCRIPTION: *Male*: Medium size, total length 3.19–3.55. COLORATION: Black, with red and white markings (fig. 2). HEAD: Black; clypeus with two lateral and one basal irregular longitudinal areas of shiny black spots; frons with two lateral areas of oblique lines composed of irregular shiny black spots; vertex with two small reddish black areas next to eyes; mandibular and maxillary plates reddish black toward apex, mandibular plate brighter; black line connecting bases of mandibular and maxillary plates with antennal socket and eye; labrum shiny black; labium black, segments III–IV shiny black; antennae black. THORAX: Collar and anterior lobe of pronotum black; calli black with irregular shiny areas; posterior lobe of pronotum red, anterior half usually diffusely suffused with black; mesoscutum black, laterally reddish; scutellum black, reddish black on disc; proepisternum black; proepimeron anteriorly black, posteriorly orange red; mesepisternum and mesepimeron reddish black; mesothoracic spiracle black; metepisternum black; venter black. *Hemelytra*: Clavus black; corium mostly black, costal margin white; cuneus white, medial margin black; area between corium and membrane shiny black; membrane fuscous, veins black. *Legs*: Black, basal portion of trochanters weakly pale. ABDOMEN: Black, posterior margin of sternites weakly pale. GENITALIA: Genital capsule black; proctiger pale orange, apically brownish; parameres brown. STRUCTURE: THORAX: Metepister-

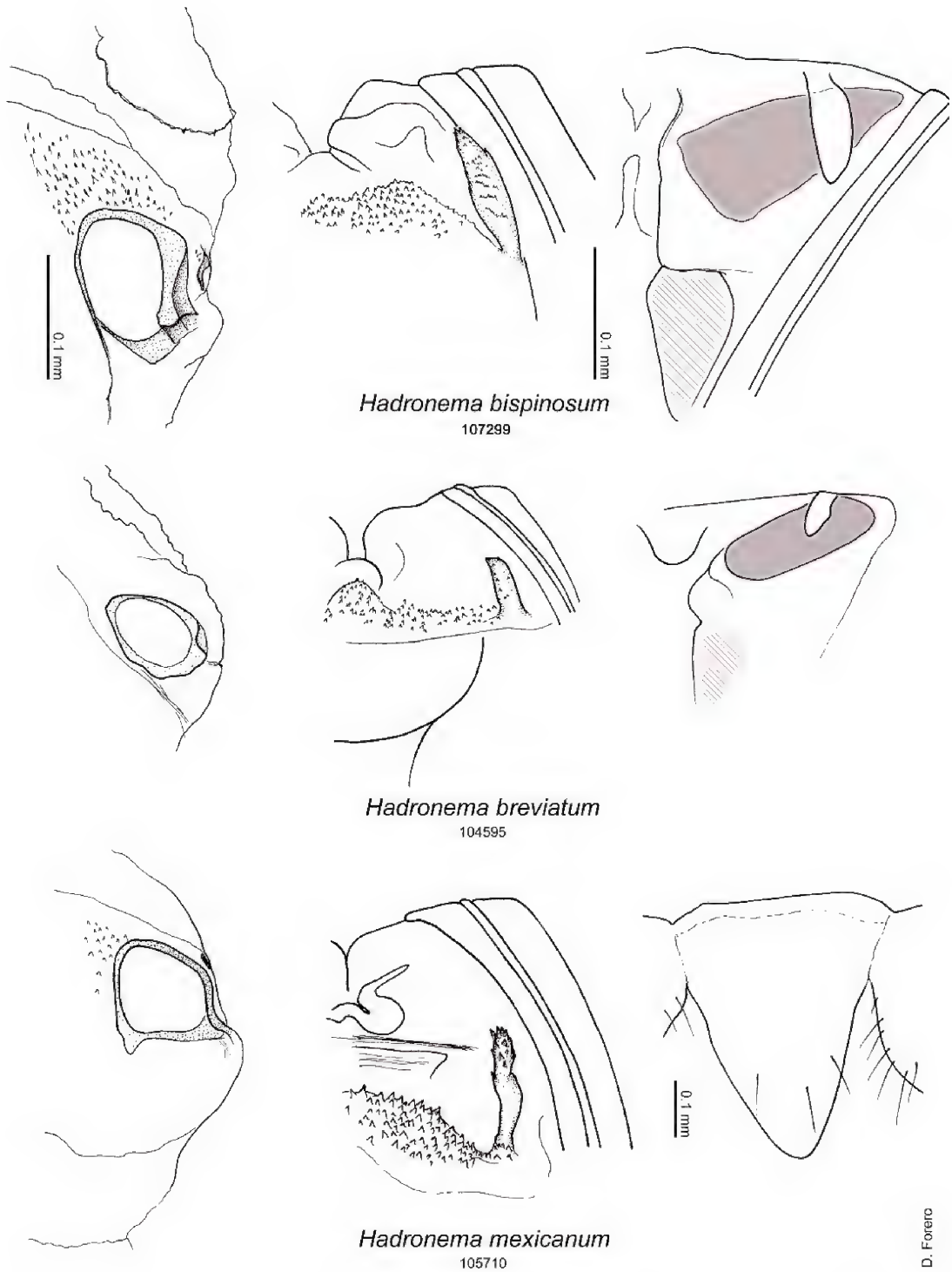

Fig. 30. *Hadronema bispinosum*, *H. breviatum*, and *H. mexicanum*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic; subgenital plate, ventral view.

num with evaporatory area rounded on dorsal margin and peritreme large. *Legs*: Profemur with basal tubercle bifid but with external process small. GENITALIA: Genital capsule subtriangular, without sensory lobe on left side, lateroventral projection on right side of medium size, blunt (fig. 28); insertion of parameres lateral; left paramere sickle-shaped (fig. 28); right paramere acute and pointed at apex (fig. 28); ventral spicule denticulate apically and gently decurved apically (fig. 27, arrows), rami subequal, thin, usually not denticulate apically, reaching and surpassing the dorsal spicule (fig. 27); dorsal spicule about a third as long as ventral one, denticulate on apical half (fig. 27).

Female: Similar to male, but larger and broader, vaguely oval (fig. 2), total length 3.61–4.14. STRUCTURE: GENITALIA: Subgenital plate triangular, acute but rounded apically, reaching middle of sternum VIII (fig. 30); dorsal lobes of interramal sclerites narrow, not long, heavily set with microtrichia apically (fig. 30); central sclerotized area on anterior wall well sclerotized, rounded, transversely divided, ventral sclerite with large process, denticulate, dorsal sclerite with small and medium-sized denticles (fig. 33); sclerotized rings as in figure 30; accessory sclerite of sclerotized rings very small (fig. 30).

DISTRIBUTION: Most known specimens from Central Mexico, in particular from the Sierra Madre Occidental and the Transverse Volcanic Axis, with a few localities in the Sierra Madre Oriental (fig. 35).

HOSTS: Few records of host plants exist for this new species. Two specimens were found on *Mimosa* (Fabaceae). Four specimens were found on an unidentified Asteraceae species.

ETYMOLOGY: The name refers to Mexico, the country of origin of all specimens examined.

DISCUSSION: Distant's (1883) record of *H. militare* from Mexico is quite probably a misidentification. The species depicted in his fig. 23 of plate 22 may be *H. mexicanum*, in particular due to the gently posteriorly curved dark spot over the posterior lobe of the pronotum. It is not clear if Reuter's (1908) mention of *H. militare* from Mexico really corresponded to this species, because I have not examined specimens of this species from Mexico. Reuter's specimens may also correspond to *H. mexicanum*. Specimens mentioned by Carvalho and Afonso (1977) as *H. breviatum* were studied, and they correspond to *H. mexicanum*, not *H. breviatum*.

Despite some intraspecific variation on spicule morphology, even from the same locality (fig. 27), I consider all the specimens examined as one species. All of them share the peculiarly decurved apex of the vesica, which is not present in any of the other species of *Hadronema*, and have a similar color pattern.

HOLOTYPE MALE: **MEXICO**: **Guanajuato**: 2 mi W of Delores Hidalgo, [21.16001°N 100.97123°W], 1986 m, 05 Jul 1985, Jones, Schaffner, Holotype *Hadronema mexicanum*, n. sp. det. D. Forero (red label), 1♂ (AMNH_PBI 00105599) (TAMU).

PARATYPES: **MEXICO**: **Durango**: 10 mi W of El Salto, 23.78333°N 105.52465°W, 2743 m, 08 Jul 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104703) (CNC). 11 mi W Durango, 24.03733°N 104.84198°W, 2134 m, 02 Aug 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104700) (CNC). 12 mi SW of Durango, 23.96281°N 104.80838°W, 24 Jul 1953, collector unknown, 1♂ (AMNH_PBI 00075249), 1♀ (AMNH_PBI 00075245) (KU). 13 mi SE of Las Nieves, 26.2664°N 105.21759°W, 16 Jul 1964, J. Powell, 1♂ (AMNH_PBI 00079999), 6♀ (AMNH_PBI 00080000–AMNH_PBI 00080005) (UCB). 2 mi S of Zarca, 25.80428°N 104.73333°W, 06 Aug 1952, J.D. Lattin, 1♂ (AMNH_PBI 00080012), 1♀ (AMNH_PBI 00080020) (UCB). 20 mi W of Durango, 24.83299°N 105.1535°W, 2195 m, 23 Jul 1964, L.A. Kelton, 13♂ (AMNH_PBI 00104704–AMNH_PBI 00104715, AMNH_PBI 00105199), 15♀ (AMNH_PBI 00104721–AMNH_PBI 00104735) (CNC). 23 mi W of Durango, 23.99°N 104.76°W, 2286 m, 23 Jul 1964, L.A. Kelton, 23♀ (AMNH_PBI 00105136–AMNH_PBI 00105158) (CNC). 22 mi NE of Durango, 24.2897°N 104.42568°W, 12 Aug 1965, H.R. Burke and J. Meyer, 1♂ (AMNH_PBI 00106024) (TAMU). 24 mi E of El Salto, 23.90584°N 105.03049°W, 22 Jul 1964, J. Powell, 1♂ (AMNH_PBI 00080009) (UCB). 25 mi S of Durango on Hwy 45, 24.46262°N 104.7383°W, 24 Jul 1964, L.A. Kelton, 22♂ (AMNH_PBI 00105097–AMNH_PBI 00105118), 7♀ (AMNH_PBI 00105119–AMNH_PBI 00105125) (CNC); 30

Jul 1964, L.A. Kelton, 4♂ (AMNH_PBI 00104716, AMNH_PBI 00105126–AMNH_PBI 00105128) (CNC). 40 mi S of Durango on Hwy 45, 23.80802°N 104.12742°W, 30 Jul 1964, L.A. Kelton, 3♂ (AMNH_PBI 00105129–AMNH_PBI 00105131), 4♀ (AMNH_PBI 00105132–AMNH_PBI 00105135) (CNC). 5 mi W of Durango, 24.83333°N 104.91298°W, 1981 m, 29 Jul 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104698), 1♀ (AMNH_PBI 00104701) (CNC). 5 mi W of Guadalupe Victoria, 24.4497°N 104.2023°W, 29 Jul 1966, P.M. and P.K. Wagner, 3♂ (AMNH_PBI 00106025–AMNH_PBI 00106027) (TAMU). 6 mi E of Durango, 24.8333°N 104.73728°W, 1981 m, 24 Jul 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104699) (CNC). Durango, 24.0333°N 104.6667°W, 31 Jul 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104693), 2♀ (AMNH_PBI 00104694, AMNH_PBI 00104695) (CNC); 26 Jun 1964, L.A. Kelton, 1♂ (AMNH_PBI 00104696) (CNC); 04 Jul 1964, L.A. Kelton, 1♀ (AMNH_PBI 00104697) (CNC). Navajos, 20 mi E of El Salto, 23.78333°N 105.05069°W, 2438 m, 27 Jul 1964, L.A. Kelton, 8♂ (AMNH_PBI 00104679–AMNH_PBI 00104685, AMNH_PBI 00105200), 4♀ (AMNH_PBI 00104688–AMNH_PBI 00104691) (CNC); 23 Jul 1964, L.A. Kelton, 1♀ (AMNH_PBI 00104692) (CNC). Navios, 26 mi E of El Salto, 23.78278°N 104.95381°W, 2438 m, 11 Aug 1964, L.A. Kelton, 5♂ (AMNH_PBI 00104675–AMNH_PBI 00104678, AMNH_PBI 00105195), 2♀ (AMNH_PBI 00104686, AMNH_PBI 00104687) (CNC). **Guanajuato**: 2 mi W of Delores Hidalgo, 21.16001°N 100.97123°W, 1986 m, 05 Jul 1985, Jones, Schaffner, 1♀ (AMNH_PBI 00105601) (TAMU); 05 Jul 1985, J.B. Woolley, 1♂ (AMNH_PBI 00105709), 2♀ (AMNH_PBI 00105710, AMNH_PBI 00105711) (TAMU). San Luis de la Paz, 21.3°N 100.51666°W, 06 Sep 1996, L.A. Kelton, 2♂ (AMNH_PBI 00105083, AMNH_PBI 00105084), 2♀ (AMNH_PBI 00105092, AMNH_PBI 00105093) (CNC). Silao, 20.93333°N 101.43333°W, 1953, C. and P. Vaurie, 1♂ (AMNH_PBI 00100845) (AMNH). **Jalisco**: El Tigre, 18 Jul 1954, E.I. Schlinger, 1♂ (AMNH_PBI 00080008) (UCB). **Mexico**: 8 mi ENE of Guadalupe Victoria, 1829 m, 14 Jul 1959, R.B. Selander and J.C. Schaffner, 1♂ (AMNH_PBI 00106800), 3♀ (AMNH_PBI 00106813–AMNH_PBI 00106815) (USNM). Jilotepec, 19.95277°N 99.53472°W, 02 Sep 1969, L.A. Kelton, 4♂ (AMNH_PBI 00105074–AMNH_PBI 00105077) (CNC). **Michoacan**: 22 mi W of Morelia, 19.71652°N 101.52398°W, 17 Jul 1953, collector unknown, 1♂ (AMNH_PBI 00075244) (KU). 9 km NE Patzcuaro (Km. 48 on Hwy 120), 19.58643°N 101.56804°W, 09 Jul 1981, J.D. Pinto, 1♂ (AMNH_PBI 00083508), 2♀ (AMNH_PBI 00083509, AMNH_PBI 00083510) (UCR). **Morelos**: Cuernavaca, 18.91666°N 99.25°W, 13 Jul 1977, Linnavuori, 1♂ (AMNH_PBI 00101333) (AMNH). **Oaxaca**: 9 mi NE of Mitla, 17.04558°N 96.38786°W, 2409 m, 20 Jul 1985, J.B. Woolley and G. Zolnerowich, 2♂ (AMNH_PBI 00105705, AMNH_PBI 00105706) (TAMU). El Paradon, 24 Aug 1969, L.A. Kelton, 1♂ (AMNH_PBI 00105073) (CNC). Etla, 17.15°N 96.75°W, 23 Aug 1969, L.A. Kelton, 1♂ (AMNH_PBI 00105081) (CNC). Huajuapan, 17.8°N 97.76667°W, 1633 m, 25 Aug 1969, L.A. Kelton, 3♂ (AMNH_PBI 00105078–AMNH_PBI 00105080), 2♀ (AMNH_PBI 00105085, AMNH_PBI 00105086) (CNC). **Puebla**: 10 mi E of Puebla, 19.05261°N 98.04288°W, 03 Jul 1952, E.E. Gilbert and C.D. MacNeil, 1♂ (AMNH_PBI 00080010), 7♀ (AMNH_PBI 00080013–AMNH_PBI 00080019) (UCB). 3 km SW Zalayeta on Route 140, 19.39298°N 97.41257°W, 13 Sep 1989, E. Barrera, T.J. Henry, I. M. Kerzhner, 3♂ (AMNH_PBI 00107024–AMNH_PBI 00107026) (USNM). Cholula, Trailer Park Las Americas, 19.06667°N 98.3°W, 16 Sep 1980, S.W. Nichols, 1♂ (AMNH_PBI 00125475) (CUIC). Erradura, 20 mi E of Libres, 19.47872°N 97.53558°W, 2479 m, 20 Aug 1958, H.F. Howden, (Asteraceae), 4♂ (AMNH_PBI 00104718, AMNH_PBI 00104736–AMNH_PBI 00104738) (CNC). San Miguel Texmelucan, 19.93333°N 97.71666°W, 27 Aug 1969, L.A. Kelton, 2♂ (AMNH_PBI 00105069, AMNH_PBI 00105070), 2♀ (AMNH_PBI 00105071, AMNH_PBI 00105072) (CNC). **Queretaro**: 10 mi E of San Juan del Rio, 20.38327°N 99.84492°W, 30 Jul 1954, J.G. Chillcott, 2♂ (AMNH_PBI 00104719, AMNH_PBI 00104720) (CNC). San Juan del Rio, 20.38333°N 99.98333°W, 03 Sep 1969, L.A. Kelton, *Mimosa* sp. (Fabaceae), 2♂ (AMNH_PBI 00104717, AMNH_PBI 00105082) (CNC); 18 Aug 1954, J.G. Chillcott, 1♀ (AMNH_PBI 00104739) (CNC). **San Luis Potosi**: 20 mi S of Santa Maria del Rio, 21.5956°N 100.75149°W, 1951 m, 26 Jul 1988, Ferreira and Schaffner, 2♂ (AMNH_

PBI 00105707, AMNH_PBI 00105708) (TAMU). **Zacatecas**: 5 mi S of Fresnillo, 23.11068°N 102.8°W, 07 Aug 1954, E.G. Linsley, J.W. MacSwain, R.F. Smith, 2♂ (AMNH_PBI 00080006, AMNH_PBI 00080007) (UCB). 9 mi S of Fresnillo, 23.05322°N 102.8°W, 20 Aug 1956, D.D. Linsdale, 1♂ (AMNH_PBI 00080011) (UCB).

OTHER SPECIMENS EXAMINED: **MEXICO**: **Aguascalientes**: 14 mi W of Aguascalientes, 21.99985°N 102.71945°W, 10 Jul 1983, Kovarik, Harrison, and Schaffner, 2♀ (AMNH_PBI 00106030, AMNH_PBI 00106296) (TAMU). **Coahuila**: 15 mi S Saltillo, 25.19876°N 101°W, 08 Jul 1983, Kovarik, Harrison, and Schaffner, 2♀ (AMNH_PBI 00106028, AMNH_PBI 00106029) (TAMU). **Durango**: 1 mi N of El Chorro, 24.29786°N 104.43333°W, 1952, collector unknown, 1♀ (AMNH_PBI 00075218) (KU). 1 mi N of Registro, 23.99786°N 104.41666°W, 17 Sep 1950, R.F. Smith, 5♀ (AMNH_PBI 00080025–AMNH_PBI 00080029) (UCB). 18 mi SE of Nombre de Dios, 23.66493°N 104.03112°W, 2134 m, 17 Jul 1959, R.B. Selander and J.C. Schaffner, 1♀ (AMNH_PBI 00107027) (USNM). 3 mi E of El Paraiso, 2065 m, 22 Sep 1950, R.F. Smith, 1♀ (AMNH_PBI 00101332) (AMNH). 3 mi E of El Salto, 23.75774°N 105.41512°W, 2560 m, 02 Jul 1964, L.A. Kelton, 1♀ (AMNH_PBI 00104702) (CNC). 6 mi E of Vicente Guerrero, 09 Jul 1964, A.G. Raske, 2♀ (AMNH_PBI 00080023, AMNH_PBI 00080024) (UCB). 7 mi N of El Entronque, 14 Sep 1950, R.F. Smith, 1♀ (AMNH_PBI 00101331) (AMNH). **Guanajuato**: 3 mi NE of Santa Rosa, 05 Jul 1985, Jones and Schaffner, 1♀ (AMNH_PBI 00105600) (TAMU). Ojo de Agua, 20.65°N 100.58333°W, 06 Sep 1969, L.A. Kelton, 5♀ (AMNH_PBI 00105087–AMNH_PBI 00105091) (CNC). **Jalisco**: 6 mi NE of Jalostitlan, 21.23353°N 102.35116°W, 1890 m, 20 Aug 1954, J.G. Chillcott, 1♀ (AMNH_PBI 00104740) (CNC). Los Reyes, 19.2°N 98.9°W, 31 Aug 1969, L.A. Kelton, 1♀ (AMNH_PBI 00105094) (CNC). **Michoacan**: 2 mi SE of Los Reyes, 19.58175°N 102.46097°W, 02 Jul 1952, E.E. Gilbert and C.D. MacNeil, 1♀ (AMNH_PBI 00080021) (UCB). **Oaxaca**: 62 mi NW of Oaxaca on [route] 190, 17.63887°N 97.46949°W, 1905 m, H.V. Weems, Jr., 1♀ (AMNH_PBI 00243739) (FSCA). 8 mi NW of Tutla, 17.8338°N 97.68816°W, 1676 m, 06 Oct 1975, J. Powell, J. Chemsak, T. Eichlin, T. Friedlander, 1♀ (AMNH_PBI 00080022) (UCB). Oaxaca, 17.03333°N 96.73333°W, 21 Aug 1969, L.A. Kelton, 2♀ (AMNH_PBI 00105095, AMNH_PBI 00105096) (CNC).

Hadronema militare Uhler
Figures 2, 24, 25, 29, 32, 34, 36

Hadronema militaris Uhler, 1872: 412 [n. sp.]; Uhler, 1886: 18 [list, distribution]; Townsend, 1891: 54 [list]; Townsend, 1892: 193 [distribution]; Cockerell, 1893: 363 [list, distribution]; Uhler, 1895: 31 [distribution]; Crevecoeur, 1905: 233 [list, distribution]; Tucker, 1907: 60 [list]; Van Duzee, 1917: 385 [catalog]; Gibson, 1918: 82 [key, note]; Knight, 1918: pl. 1 [fig. claw]; Knight, 1923: 501 [diagnosis, distribution, host]; Knight, 1925: 182 [list]; Blatchley, 1926: 844 [diagnosis, distribution, host]; Kelton, 1959: 30 [male genitalia]; Kelton, 1980: 228 [diagnosis, host, distribution]; Schuh, 1995: 115 [catalog].

Oncotylus militaris: Uhler, 1872: 471 [list].

Hadronema (*Hadronema*) *militaris*: Knight, 1928: 177 [subgeneric placement, distribution, key].

Hadronema militare: Knight, 1941: 84 [distribution]; Froeschner, 1949: 139, 167 [key, list, distribution]; Carvalho, 1958: 69 [catalog]; Steyskal, 1973: 204 [emendation]; Maw et al., 2000: 117 [list].

Hadronema (*Hadronema*) *militare*: Henry and Wheeler, 1988: 411 [catalog].

DIAGNOSIS: Recognized by the relatively large size (table 1); the metathoracic scent-gland evaporatory area strongly reduced; the genital capsule subquadrangular, with the lateral right prolongation long (fig. 29, arrow); the insertion of left paramere on the genital capsule almost ventral, appearing cleft in ventral view (fig. 24C–E); the left paramere weakly curved, abruptly and strongly curved before the apex, forming an apical notch (fig. 29, arrow); and the subgenital plate of females long, truncate apically, nearly reaching apex of eighth sternum (fig. 34).

Hadronema militare is most similar to *H. incognitum* in size, structure, and coloration. It can be distinguished from the latter by the apically strongly notched left paramere (fig. 29, arrow), which is gently curved apically in *H. incognitum* (fig. 29, arrow); the blunt apex of the right paramere (fig. 29, arrow), which is rather acute in *H. incognitum* (fig. 29, arrow); the relative length of the

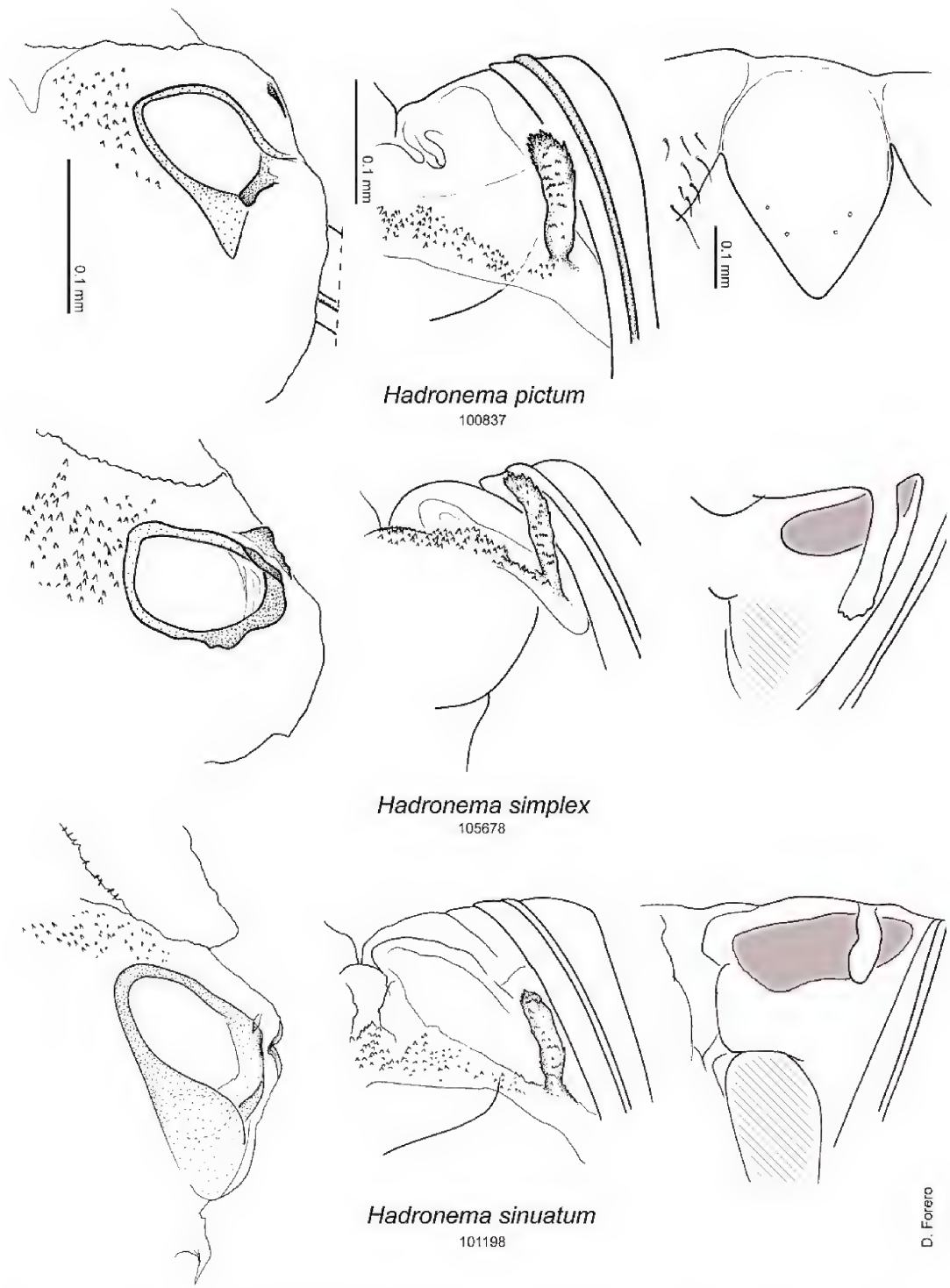

Fig. 31. *Hadronema pictum*, *H. simplex*, and *H. sinuatum*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; subgenital plate, ventral view; interramal sclerite with dorsal lobe, anterior view, schematic.

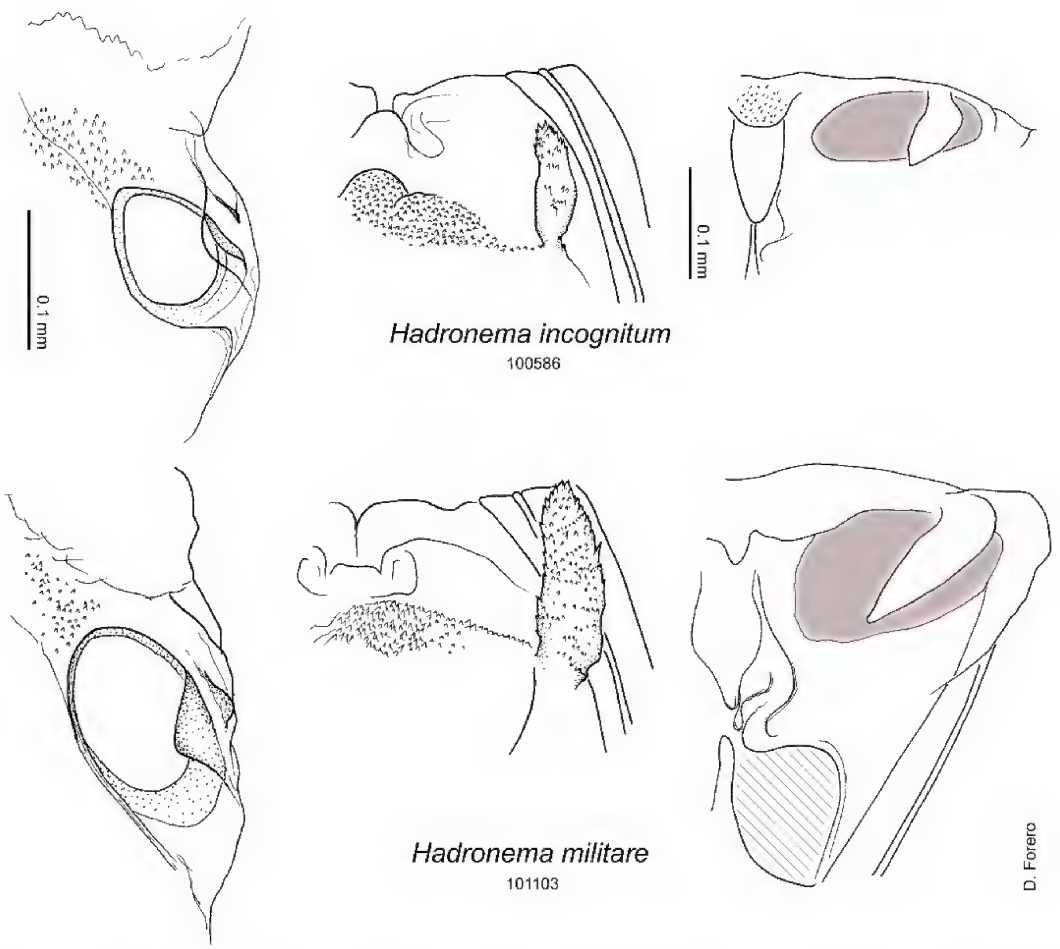

Fig. 32. *Hadronema incognitum* and *H. militare*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic.

lateral right process of the genital capsule, which is barely shorter and nearly truncate in *H. militare* (fig. 29, arrow), and longer and rounded in *H. incognitum* (fig. 29, arrow); and by having the longest ramus of the ventral spicule clubbed apically (fig. 29, arrow), which is not clubbed in *H. incognitum* (fig. 29, arrow). Other *Hadronema* species may resemble *H. militare* in coloration, but only *H. breviatum*, *H. incognitum*, and *H. simplex* share a reduced evaporatory area on the metepisternum. *Hadronema militare* can be further separated from *H. breviatum* and *H. simplex* due to the shape of the genital capsule, which is subtriangular in these two species but subquadrangular in *H. militare*, and by the overall larger size of the latter. As with other species of *Hadronema*, females are difficult to identify if they are not associated with males. Nevertheless, unassociated females may be assigned to either *H. militare* or *H. incognitum* due to the elongate and truncate subgenital plate. All females of other species of *Hadronema* share a shorter and roundly acute subgenital plate.

REDESCRIPTION: *Male*: Large, total length 4.31–4.45. COLORATION: Black with red and whitish markings (fig. 2). HEAD: Black, clypeus with two lateral and one basal longitudinal irregular shiny black markings; frons with two longitudinal areas of irregular oblique shiny black lines; two shiny black areas in front of ocular ridge next to eyes; suture between mandibular and maxillary

plates shiny black, apex of plates weakly reddish black; labrum black, shiny; labium black, segments III–IV shiny black; antennae pitch black. THORAX: Collar black; pronotum black, anterior margin reddish black; calli black with scattered irregular shiny areas; posterior lobe mostly black, fading to red orange posteriorly, posterior margin whitish; mesoscutum reddish black; scutellum black, apically weakly pale; proepisternum black; proepimeron with anterior half reddish black, posterior half reddish orange, ventroposterior margin pale; mesepisternum and mesepimeron black, central area reddish black; metepisternum black, weakly reddish black on margins; sternum black. *Hemelytra*: Clavus black; corium mostly black, costal margin and adjacent area white; cuneus mostly white; area between corium and membrane shiny black; membrane fuscous, veins dark brown. *Legs*: Black, membrane of femur-tibia articulation weakly orange. ABDOMEN: Black, membrane on dorsal margin of sternites orange, posterior margin whitish. GENITALIA: Genital capsule black; proctiger bright orange, ventral surface brown; left paramere brownish black, apically pale orange; right paramere brown. STRUCTURE: THORAX: Metepisternum with evaporatory area strongly reduced, peritreme greatly enlarged (fig. 24B). *Legs*: Profemur with basal process large, bifid (fig. 25D). GENITALIA: Genital capsule subquadrangular, appearing cleft in ventral view (fig. 24C–E), left side posteriorly rounded and beset with numerous long setae forming a sensory lobe (fig. 24C); right side with a long posteriad prolongation (fig. 29, arrow); supragenital bridge heavily sclerotized; left paramere insertion almost ventral, weakly curved, strongly notched before apex, with two apical small processes apically, one directed ventrad (fig. 29, arrow); right paramere usually blunt at apex, not acuminate; rami subequal in length, anterior one shorter, posterior one barely longer; longer ramus a little greater in diameter and clubbed apically; dorsal spicule about a third the length of ventral spicule, denticulate apically (fig. 29).

Female: Similar in coloration and structure to male (fig. 2), but larger and more strongly oval, total length 5.02–5.22. STRUCTURE: GENITALIA: Subgenital plate subrectangular, long, almost reaching posterior margin of sternite VIII, apex truncate (fig. 34); dorsal lobes of interramal sclerites wide (fig. 32); central sclerotized area of posterior wall heavily sclerotized, trapezoidal, not divided transversely, medial posteriorly directed tubercle prominent, not bearing numerous small tubercles, dorsal margin with a very small tubercle, sometimes almost nonexistent (fig. 34); sclerotized rings as in figure 32.

DISTRIBUTION: *Hadronema militare* is broadly distributed in North America, ranging from the Sierra Nevada east to New York state and north into Canada, with records absent from the Great Plains (fig. 36). Published records from California for *H. militare* should be considered with caution because *H. incognitum* is the species mainly represented in the area. Crevecoeur (1905) recorded *H. militare* from Kansas ("5 mi NE of Onaga"). I have not examined any specimen from Kansas to confirm his observation. Nonetheless, if true, this locality will be situated in the middle of the Great Plains, filling the gap between the western and eastern distributions for *H. militare*. Knight (1923) and Blatchley (1926) recorded *H. militare* from the eastern United States. Specimens examined agree with their observation of having only this species of *Hadronema* in the East.

HOSTS: *Hadronema militare* has been associated chiefly with species of *Lupinus* and other Fabaceae. Knight (1923) recorded *H. militare* from *Baptisia tinctoria*, Blatchley (1926) from *B. alba* var. *macrophylla* (as *Baptisia leucantha*), and Kelton (1980) from *Thermopsis rhombifolia* (Fabaceae). Label data for the material examined show that *H. militare* has been frequently collected on *Lupinus albifrons*, *L. argenteus*, *L. perennis*, and mostly on unidentified species of *Lupinus*. Other Fabaceae include *Oxytropis lambertii*, "*Psoralea*" sp., and *Vicia* sp. Some specimens were found on *Penstemon strictiformis* (Scrophulariaceae), probably a misidentified host due to sweep collecting. The specimens collected on *Picea* sp. (Pinaceae), *Sarcobatus vermiculatus* (Sarcobataceae), and *Solidago* sp. (Asteraceae) are apparently sitting records.

Hadronema militare has been associated with the meloids *Lytta nutalli* Say and *L.*

viridana LeConte (Young, 1984a, and references therein). Some of the host plant records for *H. militare* may be in fact hosts for species of *Lytta* (e.g., *L. nutalli* on *Thermopsis montana* and *Vicia americana*, and *L. viridana* on species of *Astragalus* [as *Cnemidophacos* and *Diholcos*, Selander, 1960]).

DISCUSSION: A female in the USNM is labeled as the "type" of *H. militare*. Nevertheless, a lectotype designation has never been formally made, and this female may have been designated merely for curatorial purposes. A male found in the USNM bears two labels of "*Oncotylus militaris*", an early designation for this taxon (see list of species in Uhler, 1872: 471). In this specimen are preserved the vestiture, antennae, and left foreleg and middle right one. All the other legs are missing. The genital capsule bears all the setae, and the preapical notch is clearly evident on the left paramere. The character on the left paramere allows for separation from *H. incognitum*. All these characters help unambiguously identify this specimen as *H. militare*, and I therefore designate it as the lectotype for this species.

LECTOTYPE MALE (here designated): [**USA**: **Colorado**: ***Weld Co.***: Weld County, 40.63333°N 104.53333°W], "col. june," P.R. Uhler collection, "*Oncotylus*? *militaris* Uhler Weld Co. Colorado," "*Oncotylus*? *militaris* Uhler Weld Co. Colorado" det. Uhler, Lectotype *Hadronema militaris* Uhler, 1872 desig. by D. Forero (red label), 1♂ (AMNH_PBI 00070386) (USNM).

PARALECTOTYPES: **USA**: **Colorado**: ***Unknown Co.***: Unknown locality, Type No. 1121 U.S.N.M., 1♀ (AMNH_PBI 00160641) (USNM); "col. june," P.R. Uhler collection, "*Oncotylus*? *militaris* Uhler", 1♂ (AMNH_PBI 00106655) (USNM); unknown locality, P.R. Uhler collection, 1♂ (AMNH_PBI 00106656) (USNM). **Utah**: ***Weber Co.***: Ogden, 41.22306°N 111.97306°W, C.V. Riley, 1♀ (AMNH_PBI 00106670) (USNM).

OTHER SPECIMENS EXAMINED: **CANADA**: **Alberta**: 18 km E of Stavely, 50.17139°N 113.38153°W, 26 Jun 1989, C. and A. von Nidek, 1♂ (AMNH_PBI 00190051), 10♀ (AMNH_PBI 00190052, AMNH_PBI 00190053, AMNH_PBI 00190064, AMNH_PBI 00190066, AMNH_PBI 00190067, AMNH_PBI 00190075–AMNH_PBI 00190079) (ZMAN). Brooks, 50.56666°N 111.9°W, 13 Jun 1957, Brooks and McNay, 2♂ (AMNH_PBI 00104411, AMNH_PBI 00104412), 2♀ (AMNH_PBI 00104413, AMNH_PBI 00104414) (CNC). Calgary, 51.08333°N 114.08333°W, 25 Jun 1974–29 Jun 1974, C. von Nidek, 1♂ (AMNH_PBI 00190061), 2♀ (AMNH_PBI 00190060, AMNH_PBI 00190062) (ZMAN); 21 Jun 1972–23 Jun 1972, C. von Nidek, 1♂ (AMNH_PBI 00190073), 3♀ (AMNH_PBI 00190070–AMNH_PBI 00190072) (ZMAN). Clarinda, 49.09566°N 111.74316°W, 960 m, 15 Jun 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00104514) (CNC). Clear Prairie, 56.56666°N 119.51666°W, 16 Jun 1961, A.R. Brooks, 1♂ (AMNH_PBI 00104516) (CNC). Coutts, 49°N 111.95°W, 15 Jun 1952, L.A. Konotopetz, 2♂ (AMNH_PBI 00104419, AMNH_PBI 00104420) (CNC); 15 Jun 1952, A.R. Brooks, 1♂ (AMNH_PBI 00104421), 3♀ (AMNH_PBI 00104422–AMNH_PBI 00104424) (CNC). Crossfield, 51.4333°N 114.03329°W, 22 Jun 1981, C. von Nidek, 1♀ (AMNH_PBI 00190068) (ZMAN). Cypress Hills Provincial Park, 49.66666°N 109.51666°W, 16 Jul 1973, G.S. Jamieson, 1♂ (AMNH_PBI 00104518), 1♀ (AMNH_PBI 00104519) (CNC). Cypress Hills Provincial Park, Top Road, 1.2 km E of Spruce Coulee, 49.63°N 110.2°W, 1433 m, 15 Jul 1990, M.D. Schwartz, *Lupinus argenteus* Pursh (Fabaceae), 24♂ (AMNH_PBI 00103645–AMNH_PBI 00103668), 24♀ (AMNH_PBI 00103669–AMNH_PBI 00103692) (CNC). Cypress Hills Provincial Park, summit (E/W) road near Route 41, 49.66222°N 110.27277°W, 03 Sep 1993, M.D. Schwartz, *Lupinus argenteus* Pursh. (Fabaceae), 1♀ (AMNH_PBI 00104589) (CNC). Elkwater, 49.63°N 110.2°W, 13 Jun 1951, L.A. Konotopetz, 1♂ (AMNH_PBI 00104347) (CNC); 06 Jun 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00104397) (CNC). Empress, 50.96666°N 110.01666°W, 07 Jun 1957, A.R. Brooks, Macnay, 1♂ (AMNH_PBI 00104515) (CNC). Fort Macleod, 49.7167°N 113.4167°W, 20 Jun 1987–21 Jun 1987, C. and A. von Nidek, 1♀ (AMNH_PBI 00190065) (ZMAN). Lethbridge, 49.7°N 112.83333°W, 20 Jun 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00104512) (CNC); 07 Jul 1932, R.M. White, 2♀ (AMNH_PBI 00104449, AMNH_PBI 00104450) (CNC); 18 Jun 1929–11 Jul 1929, J.H. Pepper, 2♂ (AMNH_PBI 00104441, AMNH_PBI 00104442) (CNC); 04 Jun 1930, J.H. Pepper, 1♂ (AMNH_PBI

00104443) (CNC); 18 Jun 1941, R.W. Salt, 4♀ (AMNH_PBI 00104451–AMNH_PBI 00104454) (CNC); 06 Jul 1925, H.E. Gray, 3♀ (AMNH_PBI 00104455–AMNH_PBI 00104457) (CNC); 18 Jun 1923, H.E. Gray, 1♀ (AMNH_PBI 00104468) (CNC); 25 Jun 1922, W. Carter, 1♀ (AMNH_PBI 00104498) (CNC); 25 Jun 1922, H.L. Seamans, 1♀ (AMNH_PBI 00104502) (CNC); 09 Jun 1923, H.L. Seamans, 1♀ (AMNH_PBI 00104503) (CNC); 06 Jul 1959, J.B. Wallis, 1♂ (AMNH_PBI 00104513) (CNC); 18 Jun 1950, B.P. Beirne, 3♂ (AMNH_PBI 00104348–AMNH_PBI 00104350), 2♀ (AMNH_PBI 00104361, AMNH_PBI 00104362) (CNC). Lethbridge, experimental farm, 49.7°N 112.83333°W, 07 Jun 1923, H.L. Seamans, 1♂ (AMNH_PBI 00104508), 1♀ (AMNH_PBI 00104509) (CNC). Manyberries, 49.4°N 110.7°W, 04 Jun 1952, A.R. Brooks, *Thermopsis* sp. (Fabaceae), 3♂ (AMNH_PBI 00104385–AMNH_PBI 00104387), 1♀ (AMNH_PBI 00104391), 3♀ (AMNH_PBI 00104388–AMNH_PBI 00104390) (CNC); 04 Jun 1952, L.A. Konotopetz, *Thermopsis* sp. (Fabaceae), 2♀ (AMNH_PBI 00104392, AMNH_PBI 00104393), 5♂ (AMNH_PBI 00104380–AMNH_PBI 00104384), 3♀ (AMNH_PBI 00104394–AMNH_PBI 00104396) (CNC). Medicine Hat, 50.03333°N 110.68333°W, 14 Jun 1930, J.H. Pepper, 2♂ (AMNH_PBI 00104499, AMNH_PBI 00104500) (CNC); 12 Jun 1930, F.S. Carr, 1♂ (AMNH_PBI 00103641) (CNC); 11 Jun 1929, J.H. Pepper, 2♀ (AMNH_PBI 00104489, AMNH_PBI 00104490) (CNC); 14 Jun 1930–16 Jun 1930, J.H. Pepper, 4♀ (AMNH_PBI 00104491–AMNH_PBI 00104494) (CNC); 02 Jun 1952, L.A. Konotopetz, *Vicia* sp. (Fabaceae), 1♂ (AMNH_PBI 00104399), 6♀ (AMNH_PBI 00104402–AMNH_PBI 00104404, AMNH_PBI 00104408–AMNH_PBI 00104410), 1♀ (AMNH_PBI 00104496) (CNC); 12 Jun 1926, F.S. Carr, 2♀ (AMNH_PBI 00104495, AMNH_PBI 00104497) (CNC); 02 Jun 1952, A.R. Brooks, *Vicia* sp. (Fabaceae), 5♀ (AMNH_PBI 00104400, AMNH_PBI 00104401, AMNH_PBI 00104405–AMNH_PBI 00104407) (CNC). Medicine Hat, Ross creek, 50.03333°N 110.68333°W, 13 Jul 1929, J.H. Pepper, 1♂ (AMNH_PBI 00104501) (CNC). Morrin, 51.66666°N 112.76666°W, 14 Jun 1929, G.F. Manson, 1♂ (AMNH_PBI 00104444), 1♀ (AMNH_PBI 00104469) (CNC). Onefour, 49.06666°N 110.45°W, 14 Jun 1952, L.A. Konotopetz, 2♀ (AMNH_PBI 00104417, AMNH_PBI 00104418) (CNC); 14 Jun 1952, A.R. Brooks, 1♂ (AMNH_PBI 00104415), 1♀ (AMNH_PBI 00104416) (CNC). Pincher Creek, Beauvais Lake, 49.55°N 113.7667°W, 14 Jun 1987–16 Jun 1987, C. and A. von Nidek, 1♀ (AMNH_PBI 00190074) (ZMAN). Rycroft, 55.76666°N 118.71666°W, 21 Jun 1961, A. R. Brooks, 1♂ (AMNH_PBI 00104446) (CNC). Standard, 51.11666°N 112.98333°W, 05 Jun 1926, H. L. Seamans, 1♂ (AMNH_PBI 00104504), 1♀ (AMNH_PBI 00104505) (CNC). Waterton Lakes National Park, 49.05°N 113.9°W, 04 Jul 1923, J. McDunnough, 2♀ (AMNH_PBI 00104507, AMNH_PBI 00104517) (CNC); 04 Jun 1970–06 Jun 1970, L.A. Kelton, 1♂ (AMNH_PBI 00105194) (CNC). Waterton Park, 49.05°N 113.91666°W, 26 Jul 1972, L.A. Kelton, 4♂ (AMNH_PBI 00104370–AMNH_PBI 00104373), 6♀ (AMNH_PBI 00104374–AMNH_PBI 00104379) (CNC); 04 Jul 1970–06 Jul 1970, L.A. Kelton, 3♂ (AMNH_PBI 00104357–AMNH_PBI 00104359), 1♀ (AMNH_PBI 00104369) (CNC); 14 Jul 1923, E.H. Strickland, 1♂ (AMNH_PBI 00104506) (CNC). **British Columbia**: 10 mi S of Merritt, 49.97209°N 120.78333°W, 19 Jul 1959, L.A. Kelton, 1♂ (AMNH_PBI 00104150), 2♀ (AMNH_PBI 00104159, AMNH_PBI 00104160) (CNC). Aspen Grove, 49.88333°N 120.63333°W, 10 Jul 1975, L.A. Kelton, 2♂ (AMNH_PBI 00104032, AMNH_PBI 00104033), 2♀ (AMNH_PBI 00104040, AMNH_PBI 00104041) (CNC). Cecil Lake, 56.3°N 120.58333°W, 15 Jun 1961, A.R. Brooks, 1♂ (AMNH_PBI 00104447), 1♀ (AMNH_PBI 00104487) (CNC). Keremeos, 49.2°N 119.81666°W, 19 Jun 1923, C.B. Garrett, 1♂ (AMNH_PBI 00104152), 1♀ (AMNH_PBI 00104154) (CNC). Merritt, 50.11666°N 120.78333°W, 19 Jul 1959, L.A. Kelton, 1♀ (AMNH_PBI 00104155) (CNC). Oliver, 49.18333°N 119.55°W, 02 Jul 1975, L.A. Kelton, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00104031), 1♀ (AMNH_PBI 00104038) (CNC); 17 May 1959, R.E. Leach, 1♀ (AMNH_PBI 00104039) (CNC). Oliver, Madden Lake, 49.18333°N 119.55°W,03 Jul 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 7♀ (AMNH_PBI 00104161–AMNH_PBI 00104167) (CNC). Oliver, McIntyre Creek, 49.18333°N 119.55°W, 27 May 1959, R.E. Leech, 1♀ (AMNH_PBI 00104158) (CNC); 04 Jul 1959, L.A. Kelton, 2♂ (AMNH_PBI

00104144, AMNH_PBI 00104145), 2♀ (AMNH_PBI 00104156, AMNH_PBI 00104157) (CNC); 03 Jul 1959, L.A. Kelton, 3♂ (AMNH_PBI 00104146–AMNH_PBI 00104148) (CNC). Oliver, White Lake, 49.18333°N 119.55°W, 23 May 1959, E.E. MacDougall, *Lupinus* sp. (Fabaceae), 2♀ (AMNH_PBI 00104112, AMNH_PBI 00104113), 1♂ (AMNH_PBI 00104050) (CNC); 27 May 1959, E.E. MacDougall, 1♂ (AMNH_PBI 00104051) (CNC); 29 Jun 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 17♂ (AMNH_PBI 00104052–AMNH_PBI 00104068), 30♀ (AMNH_PBI 00104080–AMNH_PBI 00104109) (CNC); 28 May 1959, R.E. Leech, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00104111) (CNC); 25 May 1959, R.E. Leech, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00104110) (CNC); 10 Jun 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 3♀ (AMNH_PBI 00104130–AMNH_PBI 00104132) (CNC). Osoyoos, 49.03333°N 119.46666°W, 1067 m, 14 Jul 1953, J.R. McGillis, 2♂ (AMNH_PBI 00104069, AMNH_PBI 00104070), 2♀ (AMNH_PBI 00104116, AMNH_PBI 00104133) (CNC); 25 Jun 1953, J.R. McGillis, 1♀ (AMNH_PBI 00104114) (CNC); 03 Jul 1953, J.R. McGillis, 1♀ (AMNH_PBI 00104115) (CNC). Osoyoos, Anarchist Mountain, 49.03333°N 119.33333°W, 13 Jul 1970, L.A. Kelton, 4♂ (AMNH_PBI 00104071–AMNH_PBI 00104074), 10♀ (AMNH_PBI 00104120–AMNH_PBI 00104129) (CNC); 07 Jun 1959, R. Madge, 2♂ (AMNH_PBI 00104075, AMNH_PBI 00104076) (CNC); 06 Jul 1959, R. Madge, 2♂ (AMNH_PBI 00104077, AMNH_PBI 00104078), 2♀ (AMNH_PBI 00104134, AMNH_PBI 00104135) (CNC); 05 Jul 1959, R.B. Madge, 1♂ (AMNH_PBI 00104079), 3♀ (AMNH_PBI 00104117–AMNH_PBI 00104119) (CNC). Quilchena-Pennask Lake road, km 7.1, 50.13055°N 120.39°W, 29 Jun 2001, G.G.E. Scudder, 12♂ (AMNH_PBI 00104034–AMNH_PBI 00104037, AMNH_PBI 00104042–AMNH_PBI 00104049) (CNC). Richter Pass, Osoyoos, 49.06666°N 119.58333°W, 24 May 1959, L.A. Kelton, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00104153), 1♂ (AMNH_PBI 00104151) (CNC). Rock Creek, 49.05°N 119.1°W, 07 Jun 1959, L.A. Kelton, 1♂ (AMNH_PBI 00104136), 7♀ (AMNH_PBI 00104168–AMNH_PBI 00104174) (CNC); 07 Jun 1959, E.E. MacDougall, 1♂ (AMNH_PBI 00104137), 15♀ (AMNH_PBI 00104182–AMNH_PBI 00104196) (CNC); 07 Jun 1959, R.B. Madge, 6♂ (AMNH_PBI 00104138–AMNH_PBI 00104143), 7♀ (AMNH_PBI 00104175–AMNH_PBI 00104181) (CNC). Vernon, 50.26666°N 119.26666°W, 15 Jun 1937, D.B. Waddell, 1♂ (AMNH_PBI 00104149) (CNC). **Ontario**: Belle River, 42.3°N 82.71666°W, 07 Jun 1961, L.A. Kelton, G. Brumpton, 1♂ (AMNH_PBI 00103735) (CNC). Grand Bend, 49.86666°N 88.66666°W, 15 Jun 1962, Kelton and Thorpe, *Lupinus* sp. (Fabaceae), 6♂ (AMNH_PBI 00103736–AMNH_PBI 00103741), 6♀ (AMNH_PBI 00103742–AMNH_PBI 00103747) (CNC). Ojibway, 44.88333°N 79.86666°W, 06 Jun 1961–07 Jun 1961, L.A. Kelton, G. Brumpton, *Lupinus* sp. (Fabaceae), 10♂ (AMNH_PBI 00103725–AMNH_PBI 00103734), 6♀ (AMNH_PBI 00103748–AMNH_PBI 00103753) (CNC). **Saskatchewan**: Cypress Hills, 49.58333°N 109.83333°W, 28 May 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00104360) (CNC). Elbow, 51.11666°N 106.6°W, 17 Jun 1960, A.R. Brooks, 1♂ (AMNH_PBI 00104448), 1♀ (AMNH_PBI 00104486) (CNC); 01 Aug 1951, A.R. Brooks, 7♀ (AMNH_PBI 00104470–AMNH_PBI 00104476) (CNC); 01 Aug 1951, L.A. Konotopetz, 8♀ (AMNH_PBI 00104477–AMNH_PBI 00104484) (CNC); 03 Jun 1960, A.R. Brooks, 1♀ (AMNH_PBI 00104485) (CNC). Great Sand Hills, 50.5°N 109.08333°W, 04 Jul 1952, L.A. Konotopetz, *Psoralea* sp. (Fabaceae), 1♂ (AMNH_PBI 00104511) (CNC). Hepburn, 52.51666°N 106.73333°W, 26 Jun 1923, K.M. King, 1♂ (AMNH_PBI 00104510) (CNC). Krydor, 52.78333°N 107.06666°W, 08 Jul 1950, A.R. Brooks, 1♂ (AMNH_PBI 00104445), 1♀ (AMNH_PBI 00104488) (CNC). Mortlach, 50.45°N 106.06666°W, 20 Jun 1954, Brooks and Wallis, 2♂ (AMNH_PBI 00104425, AMNH_PBI 00104426) (CNC). Saint Victor, 49.43305°N 105.86666°W, 28 Jun 1955, A.R. Brooks, 1♂ (AMNH_PBI 00104354), 1♀ (AMNH_PBI 00104398) (CNC); 25 Jun 1955, A.R. Brooks, 2♂ (AMNH_PBI 00104351, AMNH_PBI 00104352), 3♀ (AMNH_PBI 00104364–AMNH_PBI 00104366) (CNC). Saskatoon, 52.13333°N 106.66666°W, 26 Jun 1951, L.A. Konotopetz, 2♂ (AMNH_PBI 00104427, AMNH_PBI 00104428) (CNC); 05 Jul 1950, A.R. Brooks, 1♂ (AMNH_PBI 00104430) (CNC); 10 Jun 1949, L. A. Konotopetz, 1♂ (AMNH_PBI 00104429), 4♀ (AMNH_PBI

00104434, AMNH_PBI 00104435, AMNH_PBI 00104463, AMNH_PBI 00104464) (CNC); 26 Jun 1951, L.A. Konotopetz, 1♂ (AMNH_PBI 00104432), 3♀ (AMNH_PBI 00104439, AMNH_PBI 00104440, AMNH_PBI 00104465) (CNC); 21 Jun 1949, L.A. Konotopetz, 1♀ (AMNH_PBI 00104436) (CNC); 21 Jul 1950, A.R. Brooks, 2♀ (AMNH_PBI 00104437, AMNH_PBI 00104460) (CNC); 30 Jun 1950, A.R. Brooks, 1♀ (AMNH_PBI 00104438) (CNC); 05 Jul 1949, A.R. Brooks, 2♀ (AMNH_PBI 00104458, AMNH_PBI 00104459) (CNC); 26 Jun 1950, A.R. Brooks, 1♀ (AMNH_PBI 00104461) (CNC); 10 Jun 1949, A.R. Brooks, 1♀ (AMNH_PBI 00104462) (CNC); 13 Jun 1949, L.A. Konotopetz, 2♀ (AMNH_PBI 00104466, AMNH_PBI 00104467) (CNC). Willows, 49.6°N 105.85°W, 19 Jun 1955, A.R. Brooks, 3♂ (AMNH_PBI 00104353, AMNH_PBI 00104355, AMNH_PBI 00104356), 3♀ (AMNH_PBI 00104363, AMNH_PBI 00104367, AMNH_PBI 00104368) (CNC); 24 Jun 1955, A.R. Brooks, 1♀ (AMNH_PBI 00104433) (CNC). **USA**: **Arizona**: ***Apache Co.***: White Mountains, near McNary, 33.91056°N 109.58444°W, 29 May 1932, D.K. Duncan, 5♂ (AMNH_PBI 00106638–AMNH_PBI 00106642) (USNM); 08 Jul 1940, Gertsch and Hook, 3♂ (AMNH_PBI 00101115–AMNH_PBI 00101117), 4♀ (AMNH_PBI 00101122, AMNH_PBI 00101327–AMNH_PBI 00101329) (AMNH). ***Cochise Co.***: Sierra Vista, 31.554°N 110.303°W, 01 Oct 1967–31 Oct 1967, R.F. Sternitzky, 1♂ (AMNH_PBI 00103723) (CNC). ***Coconino Co.***: 17 mi NW of Flagstaff, 35.37°N 111.79°W, 13 Aug 1975, J.C. Schaffner, 5♂ (AMNH_PBI 00105631–AMNH_PBI 00105634, AMNH_PBI 00106297), 31♀ (AMNH_PBI 00105639–AMNH_PBI 00105669) (TAMU). Flagstaff, San Francisco Mountains, 33.68333°N 109.05°W, 2621 m, 13 Aug 1934, F.E. Lutz, 1♂ (AMNH_PBI 00100780) (AMNH). Lees Cabin, 36.86748°N 111.5951°W, O. Heidemann, 2♂ (AMNH_PBI 00125445, AMNH_PBI 00125446) (CUIC). San Francisco Mountains, Coconino National Forest, 35.99444°N 112.1975°W, 2941 m, 14 Jul 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103721) (CNC). Williams, 35.24944°N 112.19028°W, H.S. Barber, 3♂ (AMNH_PBI 00106682–AMNH_PBI 00106684), 3♀ (AMNH_PBI 00106691–AMNH_PBI 00106693) (USNM). ***Navajo Co.***: 15–20 mi SW of Show Low, 34.04972°N 110.27592°W, 1707 m, 30 May 1983, Schuh, Stonedahl, and Massie, *Lupinus* sp. (Fabaceae), 7♂ (AMNH_PBI 00101104–AMNH_PBI 00101110), 1♀ (AMNH_PBI 00101118) (AMNH). 2 mi S of Pinedale, Lewis Canyon Campground, 34.27858°N 110.25083°W, 2042 m, 30 May 1983, R.T. Schuh and G.M. Stonedahl, *Lupinus* sp. (Fabaceae), 7♂ (AMNH_PBI 00100930–AMNH_PBI 00100933, AMNH_PBI 00101111–AMNH_PBI 00101113), 1♀ (AMNH_PBI 00101121) (AMNH). **California**: ***Alpine Co.***: Hope Valley, 38.77694°N 119.93277°W, 18 Jul 1948, R.C. Bynum, 1♂ (AMNH_PBI 00079894) (UCB). ***El Dorado Co.***: Angora Peak, 38.86722°N 120.07277°W, 2629 m, 12 Jul 1931, E.O. Essig, 1♂ (AMNH_PBI 00079814) (UCB). Echo Lake, 38.83389°N 120.04056°W, 23 Jul 1933, E.C. Zimmerman, 1♂ (AMNH_PBI 00106678) (USNM). Half Moon Lake, Tahoe, 38.89629°N 120.1382°W, 2482 m, 23 Jul 1915, E.P. Van Duzee, 1♂ (AMNH_PBI 00079815) (UCB). ***Inyo Co.***: 5 mi S of Crooked Creek Naval Research Station, White Mountains, 37.34222°N 118.00333°W, 3048 m, 07 Jul 1966, C.W. O'Brien, 11♂ (AMNH_PBI 00079895–AMNH_PBI 00079899, AMNH_PBI 00079906–AMNH_PBI 00079911), 6♀ (AMNH_PBI 00079900–AMNH_PBI 00079905) (UCB). ***Modoc Co.***: 5 mi SE of Fort Bidwell, Surprise Valley Dunes, 41.80944°N 120.0817°W, 09 Jun 1970, P. Opler, *Sarcobatus vermiculatus* (Sarcobataceae), 1♂ (AMNH_PBI 00079893) (UCB). ***Mono Co.***: Blanco's Corral, White Mts., 37.81888°N 118.47638°W, 3048 m, 19 Jul 1953, D.D. Linsdale, 1♂ (AMNH_PBI 00079889), 3♀ (AMNH_PBI 00079890–AMNH_PBI 00079892) (UCB). Crooked Creek Naval Res. Station, White Mountains, 37.58583°N 118.71306°W, 3048 m, 07 Jul 1966, L. and C.W. O'Brien, 14♂ (AMNH_PBI 00079841–AMNH_PBI 00079854) (UCB); 04 Aug 1966, L. and C.W. O'Brien, 1♂ (AMNH_PBI 00079818), 1♀ (AMNH_PBI 00079819) (UCB). **Colorado**: ***Archuleta Co.***: 17 mi SE of Pagosa Springs, 37.09°N 106.79°W, 18 Jun 1972, G.C. Gaumer, 1♂ (AMNH_PBI 00105630), 4♀ (AMNH_PBI 00105635–AMNH_PBI 00105638) (TAMU). Pagosa Springs, 37.26944°N 107.00917°W, 2195 m, 22 Jul 1968, L.A. Kelton, 2♂ (AMNH_PBI 00103718, AMNH_PBI 00103719), 9♀ (AMNH_PBI 00104301–AMNH_PBI

00104309) (CNC). Pagosa Springs, F4363, 37.46666°N 106.95°W, 2286 m, collector unknown, 1♀ (AMNH_PBI 00101326) (AMNH). Rt 160, 5 mi N of Pagosa Springs, 37.34172°N 107.00917°W, 27 Jun 1980, K. and R. Schmidt, *Penstemon strictiformis* Rydb. (Scrophulariaceae), det. N.H. Holmgren 1980, 13♂ (AMNH_PBI 00101024–AMNH_PBI 00101036), 11♀ (AMNH_PBI 00101054–AMNH_PBI 00101064), 7 nymphs (AMNH_PBI 00101047–AMNH_PBI 00101053) (AMNH). ***Boulder Co.***: 4 mi NW of Boulder, 40.05588°N 105.32342°W, 2103 m, 08 Jun 1961, B.H. Poole, 2♂ (AMNH_PBI 00104277, AMNH_PBI 00104278) (CNC). 4.5 mi N of Boulder, 40.08103°N 105.28145°W, 1676 m, 10 Jun 1961, J.R. Stainer, 3♂ (AMNH_PBI 00104272–AMNH_PBI 00104274), 1♀ (AMNH_PBI 00104295) (CNC). Boulder, 40.015°N 105.27°W, 1676 m, 09 Jun 1961, B.H. Poole, 2♂ (AMNH_PBI 00104279, AMNH_PBI 00104280) (CNC); 29 Jun 1932, C.H. Hicks, 2♂ (AMNH_PBI 00106627, AMNH_PBI 00106628), 4♀ (AMNH_PBI 00106629–AMNH_PBI 00106632) (USNM); 23 May 1932, C.H. Hicks, 2♂ (AMNH_PBI 00106633, AMNH_PBI 00106634), 1♀ (AMNH_PBI 00106635) (USNM); 16 May 1932, C.H. Hicks, 2♂ (AMNH_PBI 00106636, AMNH_PBI 00106637) (USNM); 12 Jun 1961, J.R. Stainer, 2♀ (AMNH_PBI 00104289, AMNH_PBI 00104290) (CNC); 09 Jun 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104291) (CNC); 05 Jun 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104293) (CNC). Boulder, 40.01498°N 105.2705°W, 1624 m, 10 Jun 1961, B.H. Poole, 2♂ (AMNH_PBI 00104275, AMNH_PBI 00104276), 2♀ (AMNH_PBI 00104292, AMNH_PBI 00104294) (CNC). Longs Peak, 40.25472°N 105.61583°W, 4340 m, 02 Jul 1939, T.D.A. Cockerell, 1♀ (AMNH_PBI 00070625) (USNM). Nederland, 39.96139°N 105.51028°W, 29 Jun 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104238) (CNC); 04 Aug 1968, L.A. Kelton, *Vicia* sp. (Fabaceae), 1♀ (AMNH_PBI 00104318) (CNC). Nederland, 39.96138°N 105.51083°W, 2591 m, 13 Aug 1960, R.K. Dreischback, 1♂ (AMNH_PBI 00106734) (USNM). Nederland, Caribou, 39.98057°N 105.57769°W, 2652 m, 07 Aug 1961, J.E.R. Stainer, 2♂ (AMNH_PBI 00104234, AMNH_PBI 00104235) (CNC). Nederland, Science Lodge, 39.96139°N 105.51028°W, 2896 m, 05 Jul 1961, J.R. Stainer, 3♂ (AMNH_PBI 00104231–AMNH_PBI 00104233), 6♀ (AMNH_PBI 00104239–AMNH_PBI 00104244) (CNC); 06 Jul 1961, J.R. Stainer, 12♂ (AMNH_PBI 00104211–AMNH_PBI 00104222), 6♀ (AMNH_PBI 00104245–AMNH_PBI 00104250) (CNC); 29 Jul 1961, J.R. Stainer, 7♂ (AMNH_PBI 00104224–AMNH_PBI 00104230), 6♀ (AMNH_PBI 00104251–AMNH_PBI 00104256) (CNC). Nederland, Science Lodge, 39.96138°N 105.51083°W, 3078 m, 03 Jul 1961, J.E.R. Stainer, 1♂ (AMNH_PBI 00104223) (CNC). Rainbow Lakes, Roosevelt National Forest, 40.01111°N 105.57917°W, 2987 m, 03 Aug 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103709), 1♀ (AMNH_PBI 00104314) (CNC). Ward, 40.06666°N 105.55°W, 2835 m, Aug 1919, collector unknown, 5♂ (AMNH_PBI 00101123–AMNH_PBI 00101127), 31♀ (AMNH_PBI 00101129–AMNH_PBI 00101159) (AMNH). Ward, 40.0722°N 105.5083°W, 2789 m, Aug 1917, T.D.A. Cockerell, 1♂ (AMNH_PBI 00101128) (AMNH). Ward, Roosevelt National Forest, 40.07222°N 105.50778°W, 30 Jul 1968, L.A. Kelton, *Solidago* sp. (Asteraceae), 3♂ (AMNH_PBI 00103706–AMNH_PBI 00103708), 3♀ (AMNH_PBI 00104315–AMNH_PBI 00104317) (CNC). ***Clear Creek Co.***: Chicago Creek, 39.73999°N 105.52125°W, 2682 m, 05 Aug 1961, B.H. Poole, 1♂ (AMNH_PBI 00104286), 1♀ (AMNH_PBI 00104593) (CNC). Doolittle Ranch, Mount Evans, 39.67528°N 105.60056°W, 2987 m, 09 Jul 1961, J.R. Stainer, 2♀ (AMNH_PBI 00104266, AMNH_PBI 00104267) (CNC); 21 Jul 1961, B.H. Poole, 1♂ (AMNH_PBI 00104197), 3♀ (AMNH_PBI 00104262–AMNH_PBI 00104264) (CNC); 17 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104198) (CNC); 10 Aug 1961, B.H. Poole, 5♂ (AMNH_PBI 00104199–AMNH_PBI 00104203), 2♀ (AMNH_PBI 00104268, AMNH_PBI 00104268) (CNC); Jul 1961, B.H. Poole, 5♂ (AMNH_PBI 00104204–AMNH_PBI 00104208), 2♀ (AMNH_PBI 00104260, AMNH_PBI 00104261) (CNC); 09 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104209) (CNC); 23 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104210), 2♀ (AMNH_PBI 00104270, AMNH_PBI 00104271) (CNC); 25 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104265) (CNC); 14 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104269) (CNC). Echo L. 10, Mount Evans, 39.65832°N 105.60333°W, 183 m, 13 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104319) (CNC). Mount Evans, 39.58°N 105.6°W, 3962 m, 04 Jul 1961, C.H. Mann, 2♀

(AMNH_PBI 00104312, AMNH_PBI 00104313) (CNC). Mount Evans, marshy clearing, 39.58859°N 105.64333°W, 3444 m, 10 Aug 1961, J.G. Chillcott, 1♂ (AMNH_PBI 00104285) (CNC). Squaw Pass Road, 39.67917°N 105.47306°W, 21 Aug 1982, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065371) (JTP). Timberline, II, Mt. Evans, 39.58859°N 105.64333°W, 183 m, 22 Jul 1961, S.M. Clark, 1♂ (AMNH_PBI 00103710) (CNC). ***Costilla Co.***: Veta Pass, 37.48528°N 105.17444°W, 09 Aug 1925, H.H. Knight, 1♂ (AMNH_PBI 00106701), 1♀ (AMNH_PBI 00106722) (USNM). ***Denver Co.***: Denver, 39.73917°N 104.98417°W, 01 Jul 1922, Stoner, 1♀ (AMNH_PBI 00070621) (USNM); 29 May 1976, J.T. Polhemus, 1♀ (AMNH_PBI 00064957) (JTP). Denver, 39.73917°N 104.98417°W, N. Banks, 4♂ (AMNH_PBI 00100774–AMNH_PBI 00100777), 3♀ (AMNH_PBI 00100785–AMNH_PBI 00100787) (AMNH). ***Douglas Co.***: 2 mi E of Greenland, 39.18249°N 104.81731°W, 03 Jul 1979, D.A. Polhemus, 3♂ (AMNH_PBI 00064946, AMNH_PBI 00064972–AMNH_PBI 00064973), 2♀ (AMNH_PBI 00064945, AMNH_PBI 00064953) (JTP). 3 mi E of Larkspur, 39.22861°N 104.83068°W, 03 Jul 1979, D.A. Polhemus, 5♂ (AMNH_PBI 00064939–AMNH_PBI 00064942, AMNH_PBI 00065425), 1♀ (AMNH_PBI 00064955) (JTP). Chatfield State Park, 39.53666°N 105.06888°W, 12 Jul 1979, J.T. Polhemus, 1♀ (AMNH_PBI 00064962) (JTP). Daniels Park, 39.48139°N 104.92528°W, 02 Jul 1979, D.A. Polhemus, 9♂ (AMNH_PBI 00065329–AMNH_PBI 00065331, AMNH_PBI 00065426–AMNH_PBI 00065431), 9♀ (AMNH_PBI 00065332–AMNH_PBI 00065336, AMNH_PBI 00065432–AMNH_PBI 00065435) (JTP). Head of Highline Canal, 39.56168°N 104.99692°W, 16 Jun 1978, J.T. Polhemus, 1♀ (AMNH_PBI 00064959) (JTP); 20 Jun 1978, J.T. Polhemus, 1♀ (AMNH_PBI 00064958) (JTP); 11 Jun 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00064936) (JTP). Perry Park, 39.25667°N 104.99194°W, 13 Jul 1977, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00064938) (JTP). Roxborough Park Road near Chatfield State Park, 39.47389°N 105.08472°W, 1707 m, 01 Jun 1981, J.T. Polhemus, 2♂ (AMNH_PBI 00065369, AMNH_PBI 00065370) (JTP). Waterton, 39.49361°N 105.08806°W, 10 Jun 1982, D.A. Polhemus, 2♂ (AMNH_PBI 00064947, AMNH_PBI 00064948) (JTP); 25 Jun 1981, J.T. Polhemus, 1♂ (AMNH_PBI 00065396) (JTP); 18 Jun 1981, D.A. Polhemus, 1♀ (AMNH_PBI 00065399) (JTP); 04 Jun 1981, D.A. Polhemus, 1♂ (AMNH_PBI 00065397), 1♀ (AMNH_PBI 00065398) (JTP); 15 Jun 1981, D.A. Polhemus, 1♀ (AMNH_PBI 00065161) (JTP); 25 May 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00064949) (JTP). ***Eagle Co.***: Minturn, 39.58637°N 106.43086°W, 2391 m, 23 Jun 1981, J.T. Polhemus, 2♂ (AMNH_PBI 00065373, AMNH_PBI 00065374) (JTP). Muddy Pass, 39.76722°N 106.60527°W, 2682 m, 15 Aug 1961, J.E.R. Stainer, 1♀ (AMNH_PBI 00104311) (CNC). ***El Paso Co.***: 3 mi N of Falcon along Meridian road, 38.97655°N 104.60806°W, 14 Jun 1988, A.L. Hicks, 2♂ (AMNH_PBI 00106686, AMNH_PBI 00106687), 1♀ (AMNH_PBI 00106694) (USNM). Colorado Springs, 38.83389°N 104.82083°W, 1803 m, 19 Jul 1901, collector unknown, 1♂ (AMNH_PBI 00106702), 1♀ (AMNH_PBI 00106723) (USNM). ***Elbert Co.***: E of Kiowa along West Bijou Creek, 39.41561°N 104.28023°W, 15 Jun 1978, D.A. and J.T. Polhemus, 1♀ (AMNH_PBI 00064956) (JTP). ***Gilpin Co.***: 5 mi S of Nederland, 39.88892°N 105.51028°W, 02 Jul 1961, J.G. Chillcott, 2♂ (AMNH_PBI 00104236, AMNH_PBI 00104237), 3♀ (AMNH_PBI 00104257–AMNH_PBI 00104259) (CNC). Tolland, 39.90498°N 105.5891°W, 2720 m, 01 Jun 1825, Stoner, 1♂ (AMNH_PBI 00070619) (USNM). ***Grand Co.***: 3 mi SW Fraser, St. Louis Creek Camp, 39.91508°N 105.85677°W, 2682 m, 30 Jul 1967, F., P., and M. Rindge, 1♂ (AMNH_PBI 00101114) (AMNH). ***Hinsdale Co.***: 3 mi S Spring Creek Pass, 37.94083°N 107.15921°W, 3018 m, 06 Aug 1997, J.C. Schaffner, 5♂ (AMNH_PBI 00105614–AMNH_PBI 00105618), 3♀ (AMNH_PBI 00105619–AMNH_PBI 00105621) (TAMU). ***Jackson Co.***: Cowdrey, 40.85972°N 106.3125°W, 2438 m, 15 Aug 1968, L.A. Kelton, 5♂ (AMNH_PBI 00103844–AMNH_PBI 00103848), 27♀ (AMNH_PBI 00103849–AMNH_PBI 00103875) (CNC). Muddy Pass, Routt National Forest, 40.37667°N 106.57917°W, 2652 m, 15 Aug 1961, J.E.R. Stainer, 1♂ (AMNH_PBI 00103720) (CNC); 21 Aug 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103711) (CNC). Rabbit Ears Pass, 40.38472°N 106.61111°W, 2896 m, 21 Jul 1896, C.F. Baker, 3♂

(AMNH_PBI 00106649–AMNH_PBI 00106651), 4♀ (AMNH_PBI 00106663–AMNH_PBI 00106666) (USNM); 20 Jul 1896, C.F. Baker, 1♂ (AMNH_PBI 00106675) (USNM). Rabbit Ears Pass, Route National Forest, 40.38472°N 106.61166°W, 2874 m, 21 Aug 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103717) *Picea* sp. (Pinaceae), 1♀ (AMNH_PBI 00104297) (CNC). near Cowdrey, Colorado-Wyoming state line on Rt 125, 40.85972°N 106.3125°W, 04 Aug 1979, J.T. Polhemus, 2♂ (AMNH_PBI 00065417, AMNH_PBI 00065418), 5♀ (AMNH_PBI 00065144–AMNH_PBI 00065147, AMNH_PBI 00065419) (JTP). ***Jefferson Co.***: Deer Creek Canyon, 39.55265°N 105.12084°W, 1981 m, 11 Jul 1986, R.T. Schuh, J.T. Polhemus, 7♂ (AMNH_PBI 00100737–AMNH_PBI 00100741, AMNH_PBI 00102648, AMNH_PBI 00102749), 5♀ (AMNH_PBI 00100742–AMNH_PBI 00100746) (AMNH). Indian Hills, 39.61667°N 105.23667°W, 2134 m, 15 Jul 1983, R.T. Schuh and D.A. Polhemus, 1♀ (AMNH_PBI 00100724) (AMNH). Lookout Mountain, 39.7324°N 105.238°W, 2134 m, 03 Jul 1922, collector unknown, 2♀ (AMNH_PBI 00070623, AMNH_PBI 00070624) (USNM). North Turkey Creek Park near Tenders, 39.59468°N 105.22014°W, 1890 m, 16 Jul 1983, R.T. Schuh, D.A. and J.T. Polhemus, 9♂ (AMNH_PBI 00100725–AMNH_PBI 00100733), 3♀ (AMNH_PBI 00100734–AMNH_PBI 00100736) (AMNH). Plainview, 39.89359°N 105.2763°W, 2070 m, 10 Jul 1927, E.L. Bell, 1♂ (AMNH_PBI 00106676) (USNM). Red Rocks Park near Morrison, 39.65361°N 105.19056°W, 1707 m, 15 Jul 1983, R.T. Schuh and D. A. Polhemus, 1♂ (AMNH_PBI 00100698) (AMNH). Upper Beaver Gulch, 39.65409°N 105.32064°W, 12 Aug 1981, D.A. Polhemus, 7♀ (AMNH_PBI 00065382–AMNH_PBI 00065388) (JTP). ***La Plata Co.***: 6 mi E Mancos, 37.34495°N 108.17917°W, 30 May 1972, W.E. Clark, 1♂ (AMNH_PBI 00105930) (TAMU). La Plata, San Juan National Forest, 37.44999°N 108.0645°W, 2591 m, 19 Jul 1968–21 Jul 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103724) (CNC). ***Larimer Co.***: 40 mi W Fort Collins, Bennett Crk. Picnic Ground, Pingree Pk. Rd., 40.58°N 105.847°W, 2256 m, 14 Jul 1986, R.T. Schuhand J.T. Polhemus, 5♂ (AMNH_PBI 00101076–AMNH_PBI 00101080), 2♀ (AMNH_PBI 00101102, AMNH_PBI 00101103) (AMNH). 46 mi W of Fort Collins, Bennett Creek Picnic Grounds, Pingree Park Road, 40.66257°N 105.50054°W, 2347 m, 14 Jul 1986, R.T. Schuh and J.T. Polhemus, 1♂ (AMNH_PBI 00101086), 2♀ (AMNH_PBI 00101088, AMNH_PBI 00101089) (AMNH). Estes Park, 40.39361°N 105.49417°W, 2286 m, 02 Jul 1961, J.R. Stainer, 13♂ (AMNH_PBI 00103693–AMNH_PBI 00103705) (CNC); 10 Aug 1961, J.R. Stainer, 27♀ (AMNH_PBI 00104320–AMNH_PBI 00104346) (CNC). Fall River Road, Rocky Mountain National Park, 40.40445°N 105.62513°W, 2896 m, 16 Aug 1968–18 Aug 1968, L.A. Kelton, 4♂ (AMNH_PBI 00104281–AMNH_PBI 00104284), 2♀ (AMNH_PBI 00104287, AMNH_PBI 00104288) (CNC). Forrester's (Colo. 2020, Colo. 1581), 40.93952°N 105.98546°W, 03 Aug 1896, Warren, 1♂ (AMNH_PBI 00106673) (USNM). Fort Collins, 40.58528°N 105.08389°W, 14 Jun 1894, C.F. Baker, 2♂ (AMNH_PBI 00106652, AMNH_PBI 00106653), 1♀ (AMNH_PBI 00106667) (USNM). Pingree Park, 40.56111°N 105.59722°W, 16 Aug 1930, T.A. Brindley, 2♂ (AMNH_PBI 00105931, AMNH_PBI 00105932), 4♀ (AMNH_PBI 00105937–AMNH_PBI 00105940) (TAMU); 03 Sep 1972, L.A. Kelton, 3♀ (AMNH_PBI 00104590–AMNH_PBI 00104592) (CNC); 23 Aug 1923, C.J. Drake, 1♀ (AMNH_PBI 00105941) (TAMU). Red Feather Lakes, 40.8025°N 105.5917°W, 2543 m, 05 Aug 1979, J.T. Polhemus, 6♂ (AMNH_PBI 00064977–AMNH_PBI 00064982), 4♀ (AMNH_PBI 00064983–AMNH_PBI 00064986) (JTP). Rist Canyon, 40.63388°N 105.19972°W, 17 Jun 1904, collector unknown, 1♂ (AMNH_PBI 00106712) (USNM). Rocky Mountain National Park, Moraine Valley, 40.33333°N 105.70833°W, 2438 m, 08 Jul 1966, J. and S. Slater, 18♂ (AMNH_PBI 00100984–AMNH_PBI 00101001), 22♀ (AMNH_PBI 00101002–AMNH_PBI 00101023) (AMNH); 08 Jul 1966, J.A. Slater, 16♂ (AMNH_PBI 00100935–AMNH_PBI 00100950), 33♀ (AMNH_PBI 00100951–AMNH_PBI 00100983) (AMNH). ***Las Animas Co.***: 1 mi N of Stonewall on Purgatoire Campground Road, 37.16667°N 105.01667°W, 2560 m, 18 Aug 1986, R.T. Schuh, 5♂ (AMNH_PBI 00101081–AMNH_PBI 00101085), 12♀ (AMNH_PBI 00101090–AMNH_PBI 00101101) (AMNH). ***Mineral Co.***: Creede, 37.84917°N 106.92583°W, 04 Jul 1977, J.T. Polhemus, 3♂ (AMNH_PBI 00064950–AMNH_PBI 00064952),

1♀ (AMNH_PBI 00064954) (JTP). 1♂ (AMNH_PBI 00106699), 1♀ (AMNH_PBI 00106721) (USNM). ***Moffat Co.***: Maybell, 40.51775°N 108.08028°W, 1805 m, 12 Aug 1973, R.R. Murray, 1♂ (AMNH_PBI 00105933) (TAMU). ***Montezuma Co.***: Dolores, 37.47389°N 108.50389°W, 15 Aug 1925, C.J. Drake, 1♂ (AMNH_PBI 00105929), 1♀ (AMNH_PBI 00105935) (TAMU); 15 Aug 1925, H.H. Knight, 1♂ (AMNH_PBI 00103643) (CNC). 1♂ (AMNH_PBI 00125443) (CUIC). 2♂ (AMNH_PBI 00106853, AMNH_PBI 00106854), 16♀ (AMNH_PBI 00106855–AMNH_PBI 00106870) (USNM). Mesa Verde National Park, 37.23333°N 108.47917°W, 2134 m, 17 Jul 1968–18 Jul 1968, L.A. Kelton, *Lupinus* sp. (Fabaceae), 3♀ (AMNH_PBI 00104298–AMNH_PBI 00104300) (CNC). Mesa Verde National Park, 37.23333°N 108.47917°W, 17 Jul 1968, L.A. Kelton, *Lupinus* sp. (Fabaceae), 5♂ (AMNH_PBI 00103712–AMNH_PBI 00103716) (CNC); 13 Jul 1930, R.L. Usinger, 3♂ (AMNH_PBI 00079836–AMNH_PBI 00079838), 14♀ (AMNH_PBI 00079841–AMNH_PBI 00079854) (UCB). ***Montrose Co.***: 18 mi E of Naturita on Colo. 90, 38.26°N 108.26°W, 07 Jul 1980, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065159) (JTP). 2 mi S Columbine Pass, 38.38822°N 108.38056°W, 05 Jul 1980, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00065007), 1♀ (AMNH_PBI 00065008) (JTP). Black Canyon of Gunnison, 38.58°N 107.75°W, 30 Jul 1941, H.S. Barber, 1♀ (AMNH_PBI 00070622) (USNM). Montrose, 38.47831°N 107.8761°W, 1890 m, 24 Jun 1893, C.P. Gillette, 1♂ (AMNH_PBI 00106654), 1♀ (AMNH_PBI 00106669) (USNM). ***Park Co.***: Santa Maria on route 285, near Glenisle, 39.44967°N 105.63287°W, 28 Jun 1980, K. and R. Schmidt, 9♂ (AMNH_PBI 00101037–AMNH_PBI 00101045), 11♀ (AMNH_PBI 00101065–AMNH_PBI 00101075) (AMNH). ***Rio Blanco Co.***: 10 mi S of Buford, Hill Creek Campground, 39.89417°N 107.53837°W, 06 Aug 1978, J.T. Polhemus, 1♀ (AMNH_PBI 00065162) (JTP). ***Routt Co.***: 8 mi S of Steamboat Springs (Colo. 2030), 40.36906°N 106.83111°W, 21 Jul 1896, Liebeck, 1♂ (AMNH_PBI 00106674) (USNM). Steamboat Springs, 40.485°N 106.83111°W, 27 Jun 1982, J.T. and D.A. Polhemus, 4♂ (AMNH_PBI 00065349–AMNH_PBI 00065352), 8♀ (AMNH_PBI 00065353–AMNH_PBI 00065360) (JTP); 23 Jul 1983, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00065309), 10♀ (AMNH_PBI 00065310–AMNH_PBI 00065319) (JTP). ***Teller Co.***: Woodland Park, 38.99389°N 105.05639°W, 2438 m, 04 Aug 1943, H.H. Ross, 1♂ (AMNH_PBI 00106711), 1♀ (AMNH_PBI 00106727) (USNM). ***Unknown Co.***: Clear Creek, N. Banks, 1♂ (AMNH_PBI 00106672) (USNM). **Idaho**: ***Custer Co.***: Stanley, 44.21139°N 114.945°W, 10 Jul 1926, R.W. Haezele, 1♂ (AMNH_PBI 00106883) (USNM). ***Franklin Co.***: Dayton, 42.11306°N 111.99278°W, 1447 m, 29 Jul 1937, R.E. Miller, 1♂ (AMNH_PBI 00106728) (USNM). ***Fremont Co.***: 14 mi N of Ashton, 44.27444°N 111.4475°W, 22 Jul 1991, R.S. Peigler, 1♂ (AMNH_PBI 00105609), 1♀ (AMNH_PBI 00105610) (TAMU). Ashton, 44.07158°N 111.4482°W, 1604 m, 02 Aug 1921, F.M. Salles, 1♂ (AMNH_PBI 00106704) (USNM). ***Idaho Co.***: Lowell, Clearwater National Forest, 46.0225°N 115.89°W, 30 Jul 1972, L.A. Kelton, 2♂ (AMNH_PBI 00104584, AMNH_PBI 00104585) (CNC). ***Latah Co.***: Genesee, 46.55083°N 116.92444°W, 23 May 1936, T.A. Brindley, 1♂ (AMNH_PBI 00106712) (USNM). Moscow, 46.7325°N 116.99917°W, 19 Jul 1936, T.A. Brindley, 1♀ (AMNH_PBI 00104030) (CNC). 1♂ (AMNH_PBI 00106698), 2♀ (AMNH_PBI 00106719, AMNH_PBI 00106720) (USNM); 05 Jun 1939–28 Jun 1939, T.A. Brindley, 2♂ (AMNH_PBI 00070617, AMNH_PBI 00070618) (USNM); 26 May 1939, T.A. Brindley, 2♂ (AMNH_PBI 00070620, AMNH_PBI 00106677) (USNM); 10 Jun 1939–15 Jun 1939, T.A. Brindley, 2♀ (AMNH_PBI 00070626, AMNH_PBI 00070627) (USNM). Moscow Mountain, 46.80361°N 116.86778°W, 18 Jun 1932, T.A. Brindley, 1♂ (AMNH_PBI 00106697) (USNM). ***Lemhi Co.***: Bannock Pass, on Rt 29, Beaverhead Mountains, Salmon National Forest, 44.81389°N 113.27056°W, 31 Jul 1994, M.D. Schwartz, *Lupinus argenteus* Pursh (Fabaceae), 2♂ (AMNH_PBI 00103840, AMNH_PBI 00103842), 1♀ (AMNH_PBI 00103841) (CNC). ***Owyhee Co.***: Henry Lake, 42.22961°N 116.3103°W, 1726 m, 12 Jul 1928, C. Wakeland, 2♂ (AMNH_PBI 00106708, AMNH_PBI 00106709) (USNM). ***Unknown Co.***: Pleasant Valley, 1981 m, 02 Jun 1931, C. Wakeland, 1♂ (AMNH_PBI 00106700) (USNM). **Indiana**: ***Lake Co.***: Hessville, 41.59559°N 87.4617°W, 181 m, 29 May 1910, W.J. Gerhard, 1♂ (AMNH_PBI

00083463) (UCR). 1♀ (AMNH_PBI 00107010) (USNM). **Massachusetts**: ***Hampden Co.***: Springfield, 42.10139°N 72.59028°W, G. Dimmock, 3♂ (AMNH_PBI 00106679–AMNH_PBI 00106681) (USNM). **Montana**: ***Gallatin Co.***: Elkhorn Ranch, Gallatin River, Upper Gallatin Canyon, 45.06786°N 111.18763°W, 2134 m, 01 Aug 1928–05 Aug 1928, J. McDunnough, 1♂ (AMNH_PBI 00104587), 1♀ (AMNH_PBI 00104594) (CNC). Unknown locality, 1676 m, 12 Jun 1913, collector unknown, 1♂ (AMNH_PBI 00106733) (USNM). ***Glacier Co.***: 5 mi N of East Glacier Park on Rt 49, Blackfeet Indian Reservation, 48.51367°N 113.21722°W, 03 Aug 1994, M.D. Schwartz, *Lupinus albifrons* Benth. (Fabaceae), 1♂ (AMNH_PBI 00103838), 1♀ (AMNH_PBI 00103839) (CNC). ***Silver Bow Co.***: Butte, 46.00389°N 112.53389°W, 20 Jul 1983, J.D. and D.R. Pinto, 4♂ (AMNH_PBI 00083057–AMNH_PBI 00083060), 4♀ (AMNH_PBI 00083061–AMNH_PBI 00083064) (UCR). **Nevada**: ***Elko Co.***: 16 mi SE of Elko on route 227, 40.72278°N 115.52125°W, 1707 m, 26 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 16♂ (AMNH_PBI 00100873–AMNH_PBI 00100887, AMNH_PBI 00102770), 42♀ (AMNH_PBI 00100888–AMNH_PBI 00100929) (AMNH). E side of Ruby Mountains, nr Thompson creek, T31NR59E, 40.5608°N 115.3053°W, 1920 m, 26 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00101110), 1♀ (AMNH_PBI 00101120) (AMNH). Ruby Mountains, Lomoille Canyon, E of Powerhouse Picnic Area, 40.69222°N 115.475°W, 1885 m, 16 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 3♂ (AMNH_PBI 00100717–AMNH_PBI 00100719), 4♀ (AMNH_PBI 00100720–AMNH_PBI 00100723) (AMNH). Ruby Mountains, summit of Harrison Pass, 40.32276°N 115.50386°W, 2134 m, 27 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00101109) (AMNH). Secret Pass, 17 mi S of I-80 on Rt 229, 40.81556°N 115.1975°W, 1905 m, 26 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 1♀ (AMNH_PBI 00101119) (AMNH). ***Nye Co.***: 3.5 mi SE of Manhattan, Toiyabe National Forest, 38.50311°N 117.02678°W, 2134 m, 13 Jul 1980, G.M. Stonedahl, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00100934) (AMNH). Northumberland Canyon Rd, Toquima Ranges, 15.5 mi E of Rt 376, 39.00464°N 116.88781°W, 2134 m, 29 Jun 1983, R.T. Schuh and M.D. Schwartz, *Lupinus* sp. (Fabaceae), 18♂ (AMNH_PBI 00100699–AMNH_PBI 00100716), 17♀ (AMNH_PBI 00100681–AMNH_PBI 00100697) *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102638) (AMNH). **New Jersey**: ***Monmouth Co.***: Hornerstown, 40.10622°N 74.51404°W, 29 m, 14 May 1910, collector unknown, 1♂ (AMNH_PBI 00100778) (AMNH). ***Passaic Co.***: Newfoundland, 41.04648°N 74.43515°W, 231 m, 30 May 1910, collector unknown, 1♀ (AMNH_PBI 00100790) (AMNH). **New Mexico**: ***Bernalillo Co.***: Sedillo, 35.09972°N 106.29555°W, 2120 m, 01 Jun 1983, J.T. Polhemus, 1♀ (AMNH_PBI 00065160) (JTP). ***Colfax Co.***: Philmont Boy Scout Ranch, near Cimarron, 36.51086°N 104.9158°W, 1960 m, 20 Jul 1983, B.J. Hanselmann, 1♂ (AMNH_PBI 00105928) (TAMU). ***Lincoln Co.***: Sierra Blanca Mountain, north of Ruidoso, 33.37083°N 105.75142°W, 19 Aug 1982, B.J. Hanselmann, 1♂ (AMNH_PBI 00105927) (TAMU). **New York**: ***Albany Co.***: Pine Bush, 42.7023°N 73.85623°W, 94 m, 11 Jun 1988, A.G. Wheeler, Jr., *Lupinus perennis* (Fabaceae), 2♂ (AMNH_PBI 00070466, AMNH_PBI 00070467), 1♀ (AMNH_PBI 00070468) (USNM); 24 Jun 1989, T.J. Henry and A.G. Wheeler, Jr., *Lupinus perennis* (Fabaceae), 2♂ (AMNH_PBI 00070469, AMNH_PBI 00070470), 3♀ (AMNH_PBI 00070471–AMNH_PBI 00070473) (USNM); 30 Jun 1984, E.R. Hoebeke, 1♂ (AMNH_PBI 00125442), 7♀ (AMNH_PBI 00125448–AMNH_PBI 00125454) (CUIC). ***Suffolk Co.***: Yaphank, Long Island, 40.83667°N 72.9175°W, 30 May 1911, C.E. Olsen, 8♂ (AMNH_PBI 00100766–AMNH_PBI 00100773), 4♀ (AMNH_PBI 00100781–AMNH_PBI 00100784) (AMNH). 1♂ (AMNH_PBI 00103644) (CNC). 1♂ (AMNH_PBI 00106843), 1♀ (AMNH_PBI 00106875) (USNM); 15 Jun 1917, G.P. Engelhardt, 1♂ (AMNH_PBI 00106847), 1♀ (AMNH_PBI 00106874) (USNM); 31 May 1911, H. G. Barber, *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00125444) (CUIC); 27 May 1911, collector unknown, *Lupinus perennis* (Fabaceae), 3♂ (AMNH_PBI 00106646–AMNH_PBI 00106648), 6♀ (AMNH_PBI

00106658–AMNH_PBI 00106662, AMNH_PBI 00107006) (USNM); 29 May 1911, C.L. Pollard, 1♀ (AMNH_PBI 00106657) (USNM). **North Dakota**: ***Dunn Co.***: Killdeer Wildlife Management Area, 10 mi NW of Killdeer, 47.44466°N 102.97869°W, 24 Jun 2000, T.J. Henry, *Oxytropis lambertii* Pursh (Fabaceae), decoloring foliage, 14♂ (AMNH_PBI 00165803–AMNH_PBI 00165816), 10♀ (AMNH_PBI 00165817–AMNH_PBI 00165826) (USNM). **Oregon**: ***Grant Co.***: 2.5 mi E of Jct. Rt. 7 and Rt. 26, ca. 18 mi W of Unity, 44.57958°N 118.45089°W, 27 Jun 1988, G.M. Stonedahl, *Lupinus* sp. (Fabaceae), 11♂ (AMNH_PBI 00100747–AMNH_PBI 00100757), 8♀ (AMNH_PBI 00100758–AMNH_PBI 00100765) (AMNH). ***Umatilla Co.***: 0.4 mi S of Jct of Rts 244 and 395, 1 mi SW of Ukiah, 45.12638°N 118.97148°W, 18 Jun 1979, M.D. Schwartz, 2♂ (AMNH_PBI 00100601, AMNH_PBI 00102751) (AMNH). Near Ukiah, 45.13417°N 118.93139°W, 23 Jun 1935, J. Schuh, 1♂ (AMNH_PBI 00100779) (AMNH). 1♂ (AMNH_PBI 00104588) (CNC). ***Union Co.***: La Grande, 45.32472°N 118.08667°W, 26 Jun 1926, E.W. Davis, 1♂ (AMNH_PBI 00106710), 1♀ (AMNH_PBI 00106726) (USNM). **South Dakota**: ***Custer Co.***: Custer, 43.76667°N 103.59833°W, 27 Jul 1927, H.H. Knight, 4♂ (AMNH_PBI 00106729–AMNH_PBI 00106732), 3♀ (AMNH_PBI 00106735–AMNH_PBI 00106737) (USNM). ***Lawrence Co.***: Black Hills, 44.41667°N 103.70833°W, 29 Jun 1973, L.A. Kelton, 1♂ (AMNH_PBI 00104586) (CNC). **Texas**: ***Dallam Co.***: Dalhart, 36.05944°N 102.51278°W, 15 Jul 1965, H.R. Burke, 1♂ (AMNH_PBI 00105934) (TAMU). **Utah**: ***SanJuan Co.***: Geyser Creek, near Taylor Flats, 38.49469°N 109.09081°W, 04 Jul 1980, J.T. and D.A. Polhemus, 10♀ (AMNH_PBI 00065148–AMNH_PBI 00065157) (JTP). Geyser Pass Road, La Sal Mountains, 38.50346°N 109.23197°W, 05 Jul 1980, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065158) (JTP). ***Sevier Co.***: 14 mi N Hwy 24 on Hwy 72, 38.58106°N 111.48509°W, 2463 m, 17 Jul 1980, G.M. Stonedahl, *Lupinus* sp. (Fabaceae), 2♂ (AMNH_PBI 00101087, AMNH_PBI 00102750) (AMNH). ***Uintah Co.***: Dodds Hollow, 21 mi NNW of Vernal, 40.65083°N 109.55722°W, 2682 m, 27 Jul 1963, F., P., and M. Rindge, 1♂ (AMNH_PBI 00101046) (AMNH). **Washington**: ***Okanogan Co.***: 2 mi NE Molson, 49.00157°N 119.16825°W, 1311 m, 25 Jun 1919, A.C. Burrill, 1♂ (AMNH_PBI 00106626) (USNM). ***Yakima Co.***: Toppenish, 46.3775°N 120.3075°W, 12 Jun 1926, E.W. Davis, 1♂ (AMNH_PBI 00106696) (USNM). Wenas, 46.87262°N 120.7739°W, 701 m, 07 Jul 1882, P.R. Uhler, 2♀ (AMNH_PBI 00101324, AMNH_PBI 00101325) (AMNH). 1♂ (AMNH_PBI 00106685), 1♀ (AMNH_PBI 00107005) (USNM). **Wyoming**: ***Albany Co.***: Medicine Bow National Forest, 41.25025°N 106.25084°W, 01 Jul 1979–02 Jul 1979, C. von Nidek, 1♀ (AMNH_PBI 00190069) (ZMAN). ***Big Horn Co.***: 21 mi W of Burgess Junction on Rt 14, 44.77°N 107.94679°W, 2591 m, 13 Aug 1986, Schuh, Schwartz, and Stonedahl, *Lupinus* sp. (Fabaceae), 2♂ (AMNH_PBI 00100665, AMNH_PBI 00100666), 1♀ (AMNH_PBI 00100656) (AMNH). 24 mi W of Burgess Junction on road to radar station, 44.77°N 108.00788°W, 2774 m, 12 Aug 1986, Schuh, Schwartz, and Stonedahl, *Lupinus argenteus* Pursh (Fabaceae), 14♂ (AMNH_PBI 00100667–AMNH_PBI 00100680), 9♀ (AMNH_PBI 00100655, AMNH_PBI 00100657–AMNH_PBI 00100664) (AMNH). Big Horn Mountains, 44.75499°N 107.78239°W, 1981 m, 17 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00103642) (CNC). 1♂ (AMNH_PBI 00106671), 3♀ (AMNH_PBI 00106688–AMNH_PBI 00106690) (USNM). ***Carbon Co.***: Saratoga, 41.455°N 106.80583°W, 29 Jul 1931, H.H. Knight, 1♂ (AMNH_PBI 00106703), 1♀ (AMNH_PBI 00106724) (USNM). ***Crook Co.***: Sundance, 44.40639°N 104.37528°W, 30 Jul 1927, H.H. Knight, 8♂ (AMNH_PBI 00106844–AMNH_PBI 00106846, AMNH_PBI 00106848–AMNH_PBI 00106852), 3♀ (AMNH_PBI 00106871–AMNH_PBI 00106873) (USNM). ***Fremont Co.***: Shoshone National Forest, 43.80913°N 109.56306°W, 07 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00106695), 5♀ (AMNH_PBI 00106714–AMNH_PBI 00106718) (USNM). ***Laramie Co.***: Cheyenne, 41.13998°N 104.82024°W, 1856 m, 14 Jul 1965, H.H. Knight, 3♂ (AMNH_PBI 00106705–AMNH_PBI 00106707), 1♀ (AMNH_PBI 00106725) (USNM). ***Teton Co.***: Jackson Hole, 43.44103°N 110.8307°W, 1983 m, 16 Jun 1965, M.W. Stone, 1♂ (AMNH_PBI 00083535), 1♀ (AMNH_PBI 00083536) (UCR). Togwotee Pass, 43.75°N 110.07917°W, 2941 m, 16 Aug 1961, J.E.R. Stainer, 1♂ (AMNH_

PBI 00103722), 1♀ (AMNH_PBI 00104296) (CNC).

Hadronema pictum Uhler
Figures 2, 27, 28, 31, 33, 35

Hadronema picta Uhler, 1895: 31 [n. sp.]; Knight, 1968: 94 [distribution, host].
Hadronema (*Hadronema*) *picta*: Knight, 1928: 180 [subgeneric placement, key, distribution]; Carvalho, 1958: 69 [catalog].
Hadronema pictum: Steyskal, 1973: 207 [emendation]; Schuh, 1995:116 [catalog]; Maw et al., 2000: 117 [list].
Hadronema (*Hadronema*) *pictum*: Henry and Wheeler, 1988: 411 [catalog].

DIAGNOSIS: Recognized by the orange-red posterior lobe of pronotum (fig. 2); the similar length of antennal segments II and III (table 1); the subequal rami of the ventral spicule of the vesica reaching the dorsal spicule (fig. 27); and the normally developed metathoracic scent-gland evaporatory area.

Hadronema pictum may be confused with *H. mexicanum*, in particular in the southern distribution area of *H. pictum* (see fig. 35), due to the red posterior lobe of the pronotum, but *H. pictum* is distinguished from *H. mexicanum* by the straight rather than decurved apex of the ventral spicule of the vesica in lateral view (fig. 27, arrows). *Hadronema militare* and *H. incognitum* both also have thin subequal rami, but in those two the genital capsule is quadrangular (fig. 29), not subtriangular as in *H. pictum* (fig. 28). Females of *H. pictum* may be confused with females of *H. breviatum* due to a similar ratio of antennal segment I respect to head width (table 1). Nonetheless, in *H. breviatum* the ratio of antennal segments II/III is greater (>1.2) than in *H. pictum* (<1.1) (see table 1). *Hadronema bispinosum* is close to the antennal ratio of segments II/III of *H. pictum*, but the paler coloration of the former easily separates it.

REDESCRIPTION: *Male*: Medium size, total length 2.95–3.35. COLORATION: Black with light red and white markings (fig. 2). HEAD: Black, frons with two longitudinal areas covered with oblique irregular lines of shiny spots, area between longitudinal areas reddish, area adjacent to eyes on frons and vertex reddish; mandibular and maxillary plates apically reddish, line connecting mandibular and maxillary plates to antennal socket black; labrum black, shiny; labial segment I reddish, II–IV black, III–IV shiny; antennae black. THORAX: Collar black; anterior lobe of pronotum weakly red; calli black with irregular shiny areas; posterior lobe reddish orange; mesoscutum reddish black with lateral areas red; scutellum black, disc reddish black; proepisternum black, sometimes weakly reddish near coxal cavity; proepimeron orange, anterior margin reddish; mesepisternum, mesepimeron, metepisternum, and metepimeron reddish black, procoxal suture black, mesopleural spiracle black; prosternum black; mesosternum black, sometimes with medial area reddish black. *Hemelytra*: Clavus and corium dark brown, wide longitudinal white marking on corium; cuneus white with inner margin dark brown; area between corium and membrane shiny brown; membrane light brown, veins brown. *Legs*: Black; coxae reddish black; proximal portion of trochanters pale yellow. ABDOMEN: Black; posterior margin of sternites whitish. GENITALIA: Genital capsule black, dorsal surface weakly reddish; proctiger orange; parameres brown. STRUCTURE: THORAX: Metepisternum with evaporatory area rounded on dorsal margin and peritreme large. GENITALIA: Genital capsule subtriangular, right ventrolateral process medium-sized, without left sensory lobe (fig. 28); paramere insertions lateral; left paramere sickle-shaped (fig. 28); dorsal spicule of vesica about a third as long as ventral, with a few denticles (fig. 27); rami of ventral spicule subequal in length, of small diameter, without large denticles on them, reaching apex dorsal spicule (fig. 27).

Female: Similar to male in coloration and structure, but more robust, total length 3.54–4.16. COLORATION (fig. 2): ABDOMEN: Sometimes lateral margins of sternites weakly orange. STRUCTURE: GENITALIA: Subgenital plate subtriangular, apex rounded, barely reaching middle of sternum VIII (fig. 31); dorsal lobes of interramal sclerites of medium size (fig. 31); central sclerotized area of anterior wall nearly rounded, divided transversely, dorsal area with small tubercles, central tubercle of ventral portion of medium size (fig. 33); sclerotized rings sometimes with caudal edge produced, accessory sclerite well sclerotized (fig. 31).

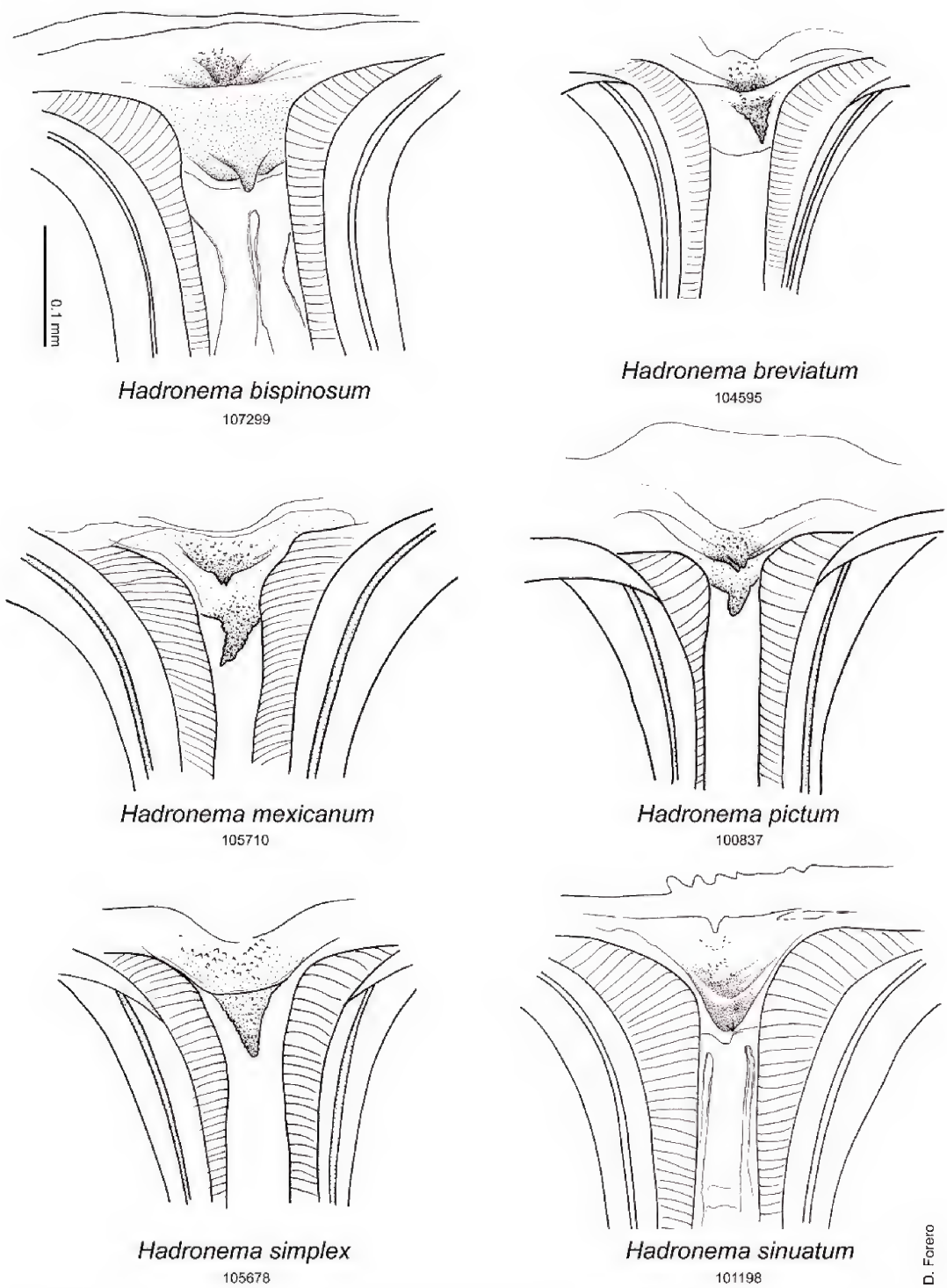

Fig. 33. *Hadronema bispinosum–H. sinuatum*. Female genitalia: anterior wall and bases of first gonapophysis, posterior view.

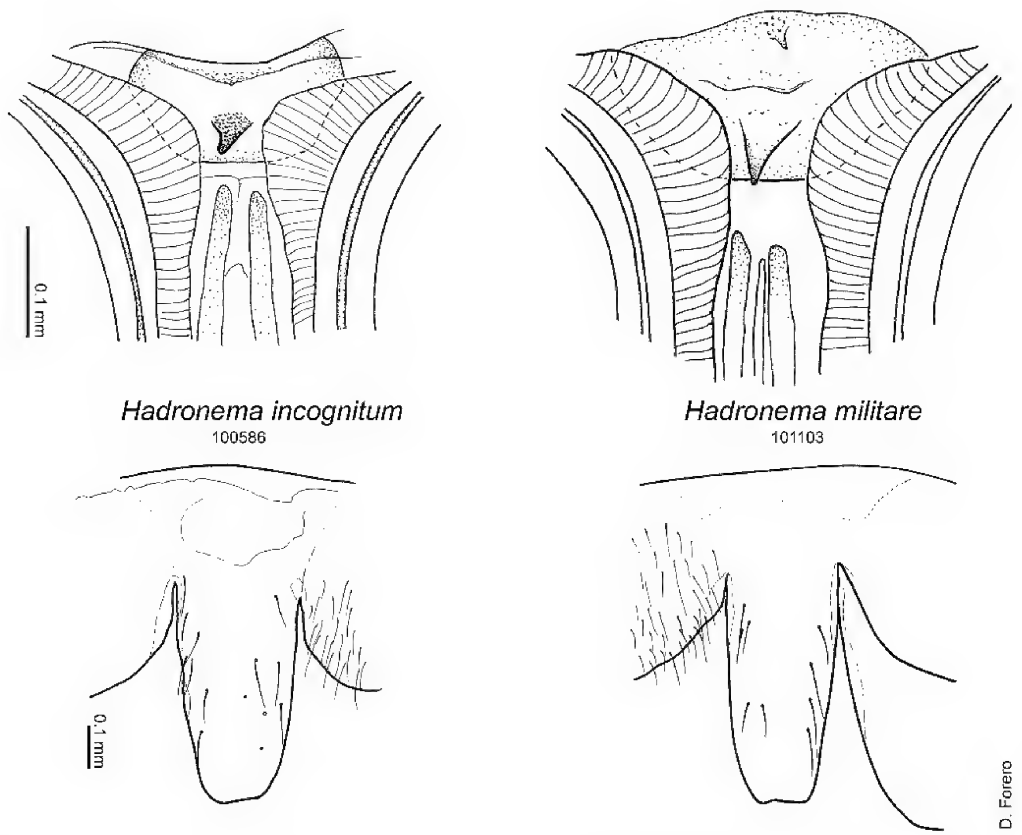

Fig. 34. *Hadronema incognitum* and *H. militare*. Female genitalia: anterior wall and bases of first gonapophysis, posterior view; subgenital plate, ventral view.

DISTRIBUTION: Widely distributed from the Central Great Plains of the United States, to the southern plains of Texas and west through New Mexico, Arizona, and the southern Great Basin to the Sierra Nevada (fig. 35). Maw et al. (2000) listed *H. pictum* as an uncertain record from Alberta (Canada). I have not examined any specimens of *H. pictum* from Canada.

HOSTS: *Hadronema pictum* has been found on Asteraceae and Fabaceae hosts. In the Fabaceae, most of the records are on *Lupinus*, and just two on *Melilotus officinalis*, and a single record on "*Psoralea*". *Heliomeris multiflora*, *H. m. nevadensis*, and *Hymenoxys ambigens floribunda* are the common Asteraceae hosts. There are just three instances on *Coreopsis grandiflora* and two on *Gutierrezia* sp. (Asteraceae). The single occurrence on *Quercus turbinella* (Fagaceae) is probably a sitting record.

DISCUSSION: A female from the USNM matching Uhler's (1895) original data ("Colorado Springs, Colorado") is in very bad condition. Only the abdomen and the posterior pair of wings remain, and therefore it is not suitable for designation as a lectotype. Another female from "Garden of the Gods," near Colorado Springs, is here designated as the lectotype in absence of a better preserved specimen and because it also matches Uhler's data of being collected in "July" by "E. S. Tucker".

The subequal antennal segments II and III were considered by Uhler (1895) as diagnostic for this species. The relative length of antennal segments II and III as used in Knight's key (Knight, 1928) may be misleading. A ratio of antennal segments II/III less than 1.1 is indicative of *H. pictum* for males and females. Nevertheless, series of specimens should be measured and male genitalia

examined to correctly identify this species. Females should always be associated with males to unambiguously assess species identities.

LECTOTYPE FEMALE (here designated): [**USA**: **Colorado**: ***El Paso Co.***:] Garden of the Gods, Colorado city, [38.86778°N 104.89056°W], July, E.S. Tucker, Lectotype *Hadronema picta* Uhler, desig. by D. Forero (red label), 1♀ (AMNH_PBI 00075286) (KU).

PARALECTOTYPE FEMALE: **USA**: **Colorado**: ***El Paso Co.***: Colorado Springs, 38.83389°N 104.82083°W, 5915 ft, E.S. Tucker, P.R. Uhler collection, "*Hadronema picta*" det. Uhler, Paralectotype *Hadronema picta* Uhler, desig. by D. Forero, 1♀ (AMNH_PBI 00107297) (USNM).

OTHER SPECIMENS EXAMINED: **USA**: **Arizona**: ***Cochise Co.***: 1 mi N of Rustler Park, Chiricahua Mts., 31.91472°N 109.26861°W, 2536 m, 18 Aug 2000–21 Aug 2000, B. Rodriguez V., 2♂ (AMNH_PBI 00105925, AMNH_PBI 00106094) (TAMU). Barefoot Park, Chiricahua Mountains, 31.88416°N 109.27916°W, 2530 m, 21 Aug 2000, T. Ohmann, 1♂ (AMNH_PBI 00106095) (TAMU). ***Coconino Co.***: 3 mi N of Flagstaff, 35.24158°N 111.65056°W, 20 Jun 1973–30 Jun 1973, J.D. Pinto, 1♀ (AMNH_PBI 00083529), 1♂ (AMNH_PBI 00083528) (UCR). Flagstaff, 35.19806°N 111.65056°W, 2134 m, 09 Aug 1934, D. Rockefeller, 2♂ (AMNH_PBI 00100820, AMNH_PBI 00100821), 1♀ (AMNH_PBI 00100822) (AMNH); 07 May 1900, Barber and Schwarz, 1♂ (AMNH_PBI 00106798) (USNM). Flagstaff Hill, 35.19806°N 111.65056°W, 29 Jun 1932, E.D. Ball, 1♀ (AMNH_PBI 00107225) (USNM). Grand Canyon, 36.05444°N 112.13861°W, 2134 m, 22 Jun 1925, A.A. Nichol, 1♂ (AMNH_PBI 00107276), 2♀ (AMNH_PBI 00107295, AMNH_PBI 00107296) (USNM). Kendrick Park, Coconino National Forest, 35.99444°N 112.1975°W, 2256 m, 15 Jul 1968, L.A. Kelton, 1♂ (AMNH_PBI 00103917), 1♀ (AMNH_PBI 00103929) (CNC). Williams, 35.24944°N 112.19028°W, 2134 m, 24 Jun 1925, A.A. Nichol, 1♂ (AMNH_PBI 00103931), 1♀ (AMNH_PBI 00103932) (CNC). *Hymenoxys ambigens floribunda* (Asteraceae), 10♂ (AMNH_PBI 00107266–AMNH_PBI 00107275), 2♀ (AMNH_PBI 00107293, AMNH_PBI 00107294) (USNM). ***Gila Co.***: 6 mi SW of Carrizo, 33.93231°N 110.3623°W, 10 Sep 1961, C.S. Raph, 1♂ (AMNH_PBI 00083479), 1♀ (AMNH_PBI 00083480) (UCR). Gila County, 33.51667°N 110.51667°W, 10 Sep 1960, Timberlake, 1♂ (AMNH_PBI 00083482) (UCR). Salome Creek, Sierra Ancha Mountains, 33.87505°N 111.04062°W, 04 Sep 1932, D.K. Duncan, 2♀ (AMNH_PBI 00107223, AMNH_PBI 00107224) (USNM). Sierra Ancha Mountains, 33.76393°N 111.08291°W, 30 Jun 1931, D.K. Duncan, 1♂ (AMNH_PBI 00107219), 3♀ (AMNH_PBI 00107220–AMNH_PBI 00107222) (USNM). ***Mohave Co.***: Kingman, 35.18944°N 114.05222°W, 08 Jun 1930, R.L. Usinger, 1♀ (AMNH_PBI 00079880) (UCB). ***Navajo Co.***: 15–20 mi SW of Show Low, 34.04972°N 110.27592°W, 1707 m, 30 May 1983, Schuh, Stonedahl, and Massie, *Lupinus* sp. (Fabaceae), 3♂ (AMNH_PBI 00100815–AMNH_PBI 00100817) (AMNH). 2 mi S of Pinedale, Lewis Canyon Campground, 34.27858°N 110.25083°W, 2042 m, 30 May 1983, R.T. Schuh and G.M. Stonedahl, *Lupinus* sp. (Fabaceae), 24♂ (AMNH_PBI 00100791–AMNH_PBI 00100814), 14♀ (AMNH_PBI 00100827–AMNH_PBI 00100840) *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00102639) (AMNH). Show Low, Sitgreaves National Forest, 34.25417°N 110.02917°W, 10 Aug 1967, L.A. Kelton, 7♂ (AMNH_PBI 00103911–AMNH_PBI 00103916, AMNH_PBI 00103905), 5♀ (AMNH_PBI 00103924–AMNH_PBI 00103928) (CNC). ***Santa Cruz Co.***: 8 mi E of Sonoita, 31.67937°N 110.51827°W, 21 Aug 1974, J.D. Pinto, 1♂ (AMNH_PBI 00083516) (UCR). Patagonia Mountains, 2.8 mi N of Washington Camp., 31.41472°N 110.69194°E, 1628 m, 23 Aug 2000–24 Aug 2000, Rodriguez, Ohmann, Woolley, 1♂ (AMNH_PBI 00106098) (TAMU). ***Yavapai Co.***: Mud Tanks Mesa, George Crook Road, 33.985°N 112.41583°W, 1981 m, 14 Jun 1983, R.T. Schuh and M.D. Schwartz, 1♀ (AMNH_PBI 00100826) *Quercus turbinella* (Fagaceae), 1♀ (AMNH_PBI 00100825) *Lupinus* sp. (Fabaceae), 1♂ (AMNH_PBI 00100818) (AMNH). **California**: ***Inyo Co.***: 9 mi NE of Big Pine, 37.257°N 118.17301°W, 1920 m, 07 Jul 1966, L. and C.W. O'Brien, 1♀ (AMNH_PBI 00079884) (UCB). **Colorado**: ***Baca Co.***: Springfield, 37.40833°N 102.61389°W, 18 Jun 1988, R. Wharton and B. Mann, 1♂ (AMNH_PBI 00106104), 1♀ (AMNH_PBI 00106116) (TAMU).

Boulder Co.: Nederland, Science Lodge, 39.96139°N 105.51028°W, 2896 m, 01 Jul 1961, J.R. Stainer, 2♀ (AMNH_PBI 00105060, AMNH_PBI 00105061) (CNC). Valmont Butte, 40.03081°N 105.2116°W, 1615 m, 01 Jun 1961, J.R. Stainer, 1♀ (AMNH_PBI 00105062) (CNC). ***Chaffee Co.***: Clear Creek Dam, 39.01805°N 106.24279°W, N. Banks, 1♂ (AMNH_PBI 00100844) (AMNH). ***Clear Creek Co.***: Doolittle Ranch, Mount Evans, 39.67528°N 105.60056°W, 2987 m, 21 Jul 1961, B.H. Poole, 1♀ (AMNH_PBI 00105068) (CNC); 08 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00105067) (CNC). Mount Evans, 39.58859°N 105.64333°W, 4267 m, 25 Jul 1961, B.H. Poole, 1♀ (AMNH_PBI 00105066) (CNC). Mount Evans, 39.58°N 105.6°W, 3962 m, 13 Jul 1961, C.H. Mann, 2♀ (AMNH_PBI 00105064, AMNH_PBI 00105065) (CNC). Timberline, II, Mt. Evans, 39.58859°N 105.64333°W, 183 m, 21 Jul 1961, J.R. Stainer, 1♀ (AMNH_PBI 00105063) (CNC). ***Douglas Co.***: Head of Highline Canal, 39.56168°N 104.99692°W, 16 Jun 1978, J.T. Polhemus, 2♀ (AMNH_PBI 00064990, AMNH_PBI 00064991) (JTP); 20 Jun 1978, J.T. Polhemus, 2♀ (AMNH_PBI 00064992, AMNH_PBI 00064993) (JTP); 03 Jul 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00064989) (JTP). Roxborough Park Road near Chatfield State Park, 39.47389°N 105.08472°W, 1707 m, 09 Jun 1978, J.T. Polhemus, 1♂ (AMNH_PBI 00065164) (JTP). Waterton, 39.49361°N 105.08806°W, 10 Jun 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065326) (JTP); 15 Jun 1984, J.T. Polhemus, 1♀ (AMNH_PBI 00064994) (JTP). Waterton, Head of Hiline, 39.49361°N 105.08806°W, 20 Jun 1980, J.T. Polhemus, 1♀ (AMNH_PBI 00065073) (JTP). ***El Paso Co.***: 7 mi SW Colorado Springs, 38.76209°N 104.91294°W, 15 Jun 1980, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00064996) (JTP). Colorado Springs, 38.83389°N 104.82083°W, 1803 m, 27 Jun 1966, J.A. Slater, 1♂ (AMNH_PBI 00100819), 2♀ (AMNH_PBI 00100823, AMNH_PBI 00100824) (AMNH). Pikes Peak, Meadow, 38.84054°N 105.04442°W, 3353 m, 13 Aug 1941, H.H. Ross, 1♂ (AMNH_PBI 00106796) (USNM). ***Elbert Co.***: 3 mi E of Kiowa, 39.34721°N 104.40765°W, 29 Aug 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065376) (JTP). Wolf Creek, 10 mi NE of Kiowa, 39.45213°N 104.39879°W, 05 Jul 1979, D.A. Polhemus, 2♂ (AMNH_PBI 00065324, AMNH_PBI 00065325) (JTP). ***Larimer Co.***: 15 mi NW Fort Collins, 40.73882°N 105.28629°W, 20 Jun 1965, S.G. Wellso, 1♂ (AMNH_PBI 00105795) (TAMU). ***Las Animas Co.***: 6 mi E of Branson, CL1612, 37.01745°N 103.77491°W, 18 Sep 1979, J.T. Polhemus, 1♂ (AMNH_PBI 00065074), 1♀ (AMNH_PBI 00065170) (JTP). NE of Trinchera, 37.04224°N 104.0474°W, 18 Sep 1979, J.T. Polhemus, *Gutierrezia* sp. (Asteraceae), 2♀ (AMNH_PBI 00065075, AMNH_PBI 00065076) (JTP). ***Logan Co.***: 15 mi N of Sterling, 40.84241°N 103.20722°W, 20 Jun 1979, D.A. Polhemus, 2♂ (AMNH_PBI 00064997, AMNH_PBI 00065163) (JTP). Sterling, 40.62556°N 103.20722°W, 26 Aug 1925, H.H.Knight, 5♂ (AMNH_PBI 00106784–AMNH_PBI 00106788), 3♀ (AMNH_PBI 00106806–AMNH_PBI 00106808) (USNM). ***Otero Co.***: Fowler, 38.12917°N 104.02329°W, 09 Jun 1904, E.S.G. Titts, 1♂ (AMNH_PBI 00106799) (USNM). ***Pueblo Co.***: 10 mi W of Pueblo, 38.2543°N 104.79323°W, 1524 m, 31 May 1979, D.A. Polhemus, 1♂ (AMNH_PBI 00064999) (JTP). 12 mi W of Pueblo off Hwy 96, 38.25444°N 104.82952°W, 15 Jun 1980, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00065000) (JTP). Siloam Road, 38.25139°N 104.97528°W, 01 Jun 1979, D.A. Polhemus, 1♂ (AMNH_PBI 00064998) (JTP). ***Weld Co.***: 8 mi N Nunn, Pawnee National Grassland, 40.75277°N 104.00333°W, 06 Jul 1968, collector unknown, *Melilotus officinalis* (Fabaceae), 1♀ (AMNH_PBI 00064995) (JTP). **Idaho**: ***Licoln Co.***: 7 mi E of Dietrich, 42.909357°N 114.125989°W, 6 Aug 1978, W.F. Barr, *Psoralea* sp. (Fabaceae), 1♂ (AMNH_PBI 00125751) (UID). **Iowa**: ***Woodbury Co.***: Hornick, 42.23055°N 96.09752°W, 19 Jun 1979, C. von Nidek, 1♂ (AMNH_PBI 00190083) (ZMAN). **Kansas**: ***Chautauqua Co.***: Chautauqua County, 37.15005°N 96.2336°W, 1916, R.H. Beamer, 1♂ (AMNH_PBI 00075240) (KU). ***Clark Co.***: Clark County, 37.23333°N 99.83333°W, N. Banks, 3♂ (AMNH_PBI 00101330) (AMNH). ***Meade Co.***: Meade County, 37.28556°N 100.33972°W, 15 Aug 1945, R.H. Beamer, 1♂ (AMNH_PBI 00075239) (KU). ***Russell Co.***: Wilson Lake, 38.98612°N 98.76702°W, 14 Jun 1983, G.C. Eickwort, 1♀ (AMNH_PBI 00125476) (CUIC). ***Sedgwick Co.***: Sedgwick, 37.71668°N 97.45032°W, 1916, R.H. Beamer, 1♂ (AMNH_PBI 00075246)

(KU). ***Seward Co.***: Seward County, 37.2°N 100.83333°W, Lantz, 1♂ (AMNH_PBI 00106790) (USNM). ***Sherman Co.***: Kanorado, 39.33305°N 102.03795°W, 04 Jul 1933, P.W. Oman, 1♂ (AMNH_PBI 00106801), 1♀ (AMNH_PBI 00106816) (USNM). **Michigan**: ***Manistee Co.***: Manistee County, 44.33333°N 86.05°W, 05 Jul 1957, R. and K. Dreisbach, 1♂ (AMNH_PBI 00106792) (USNM). **Nebraska**: ***Furnas Co.***: Cambridge, 40.28195°N 100.16569°W, A.P. Morse, 1♂ (AMNH_PBI 00101166), 1♀ (AMNH_PBI 00101173) (AMNH). ***Garden Co.***: Wood Lake, 41.91664°N 102.3501°W, 27 Jun 1973, L.A. Kelton, 1♂ (AMNH_PBI 00103906) (CNC). ***Red Willow Co.***: Indianola, 40.23444°N 100.41694°W, 05 Jul 1900, A.P. Morse, 1♂ (AMNH_PBI 00101163), 5♀ (AMNH_PBI 00101168–AMNH_PBI 00101172) (AMNH). **Nevada**: ***Clark Co.***: Charleston Peak, 36.27222°N 115.69417°W, 2286 m, 20 Jul 1982, J.T. Polhemus, 1♂ (AMNH_PBI 00065375) (JTP). Kyle Canyon, Charleston Mountains, 36.29469°N 115.44528°W, 1524 m, 04 Jul 1941, Timberlake, *Heliomeris multiflora nevadensis* (A. Nels.) Yates (Asteraceae), 7♂ (AMNH_PBI 00083465–AMNH_PBI 00083471), 7♀ (AMNH_PBI 00083472–AMNH_PBI 00083478) (UCR). ***Lincoln Co.***: Lincoln County, 38.00028°N 114.87528°W, 11 Sep 1961, Timberlake, *Melilotus officinalis* (Fabaceae), 1♀ (AMNH_PBI 00083481) (UCR). ***Nye Co.***: Mercury, 36.66056°N 115.99361°W, 22 Jun 1965, collector unknown, *Heliomeris multiflora nevadensis* (A. Nels.) Yates (Asteraceae), 1♂ (AMNH_PBI 00107261) (USNM). Mercury, 16 M, 36.66056°N 115.99361°W, 11 Jun 1965, H. Knight and J. Merino, *Heliomeris multiflora* (Asteraceae), 1♂ (AMNH_PBI 00107260), 1♀ (AMNH_PBI 00107288) (USNM); 19 Aug 1965, J. Merino, 1♀ (AMNH_PBI 00107292) (USNM). Mercury, 19 M, 36.66056°N 115.99361°W, 22 Jun 1965, H. Knight and J. Merino, *Heliomeris multiflora* (Asteraceae), 3♀ (AMNH_PBI 00107289–AMNH_PBI 00107291), 5♂ (AMNH_PBI 00106882, AMNH_PBI 00107262–AMNH_PBI 00107265) (USNM), (AMNH_PBI 00106301) (TAMU). Mercury, 401 M, 36.66056°N 115.99361°W, 18 Jun 1965, H.H. Knight and J. Merino, *Heliomeris multiflora* (Asteraceae), 5♀ (AMNH_PBI 00107280–AMNH_PBI 00107284), 3♂ (AMNH_PBI 00107257–AMNH_PBI 00107259) (USNM); 23 Jun 1965, H.H. Knight and J. Merino, 3♀ (AMNH_PBI 00107285–AMNH_PBI 00107287) (USNM). Mercury, TE, 36.66056°N 115.99361°W, 10 Jun 1965, E. Beck, H. Knight, J. Merino, 3♂ (AMNH_PBI 00107255, AMNH_PBI 00107256, AMNH_PBI 00107298), 3♀ (AMNH_PBI 00107277–AMNH_PBI 00107279) (USNM). **New Mexico**: ***Bernalillo Co.***: Sedillo, 35.09972°N 106.29555°W, 2120 m, 01 Jun 1983, J.T. Polhemus, 1♂ (AMNH_PBI 00065403) (JTP). ***Chaves Co.***: 10 mi E of Roswell, 33.39913°N 104.34623°W, 02 Aug 1975, W.F. Chamberlain, 2♂ (AMNH_PBI 00105787, AMNH_PBI 00105788), 2♀ (AMNH_PBI 00105804, AMNH_PBI 00105805) (TAMU). Roswell, Bottomless Lakes, 33.34417°N 104.33778°W, 21 Jul 1967, L.A. Kelton, 4♂ (AMNH_PBI 00103920–AMNH_PBI 00103923) (CNC). ***Grant Co.***: 19 mi NE of Lordsburg, Gila National Forest, 32.54504°N 108.47726°W, 19 Aug 1975, J.D. Pinto, 5♂ (AMNH_PBI 00083511–AMNH_PBI 00083515), 1♀ (AMNH_PBI 00083517) (UCR). ***Guadalupe Co.***: Cuervo, 35.03111°N 104.40806°W, 23 Jun 1940, D.E. Hardy, 2♂ (AMNH_PBI 00075237, AMNH_PBI 00075238) (KU). Santa Rosa, 34.93861°N 104.68194°W, 23 Jun 1941, E.L. Todd, 1♂ (AMNH_PBI 00075217) (KU). ***Harding Co.***: Gallegos, 35.60972°N 103.70667°W, 16 Jun 1992, W.F. Chamberlain, 3♀ (AMNH_PBI 00106043–AMNH_PBI 00106045) (TAMU). ***Lea Co.***: 24.8 mi W of Hobbs, 32.70177°N 103.56324°W, 15 May 1999, J.C. Schaffner, 1♂ (AMNH_PBI 00106097), 1♀ (AMNH_PBI 00106112) (TAMU). ***Los Alamos Co.***: Los Alamos, Mortandad Canyon, 35.88806°N 106.30639°W, 2189 m, 01 Sep 1976–01 Feb 1977, D.C. Lowrie, 1♂ (AMNH_PBI 00100843) (AMNH). ***Otero Co.***: Cloudcroft, 32.95731°N 105.7424°W, 2642 m, 23 Jul 1967–25 Jul 1967, L.A. Kelton, 1♀ (AMNH_PBI 00103933) (CNC). ***Quay Co.***: Canadian River, Logan, 35.35524°N 103.41404°W, 26 May 1964, L.A. Kelton, 2♂ (AMNH_PBI 00103918, AMNH_PBI 00103919) (CNC). Montoya, 35.09977°N 104.0638°W, 1317 m, 26 May 1964, L.A. Kelton, 1♀ (AMNH_PBI 00103937) (CNC). ***Rio Arriba Co.***: Echo Amphitheater, 36.36001°N 106.5317°W, 668 m, 25 Jun 1964, collector unknown, 1♂ (AMNH_PBI 00105791) (TAMU). ***San Miguel Co.***: Las Vegas, Hot Springs, 35.65389°N 105.29111°W, H.S. Barber, 1♂ (AMNH_PBI

00106782) (USNM). ***Sandoval Co.***: Jemez Springs, 35.76861°N 106.69167°W, 22 Jun 1915, Woodgate, 1♂ (AMNH_PBI 00106781), 3♀ (AMNH_PBI 00106802–AMNH_PBI 00106804) (USNM); 12 Jul 1915,Woodgate, 1♀ (AMNH_PBI 00103930) (CNC). ***Socorro Co.***: Magdalena, Cibola National Forest, 34.33333°N 107.58333°W, 21 Aug 1972, L.A. Kelton, 3♀ (AMNH_PBI 00103934–AMNH_PBI 00103936) (CNC). Socorro County, 33.93194°N 106.94889°W, 18 Aug 1927, R.H. Beamer, 2♂ (AMNH_PBI 00075275, AMNH_PBI 00075275) (KU). ***Torrance Co.***: Moriarty, 34.5924°N 106.0257°W, 1896 m, 23 Jun 1941, E.L. Todd, 1♀ (AMNH_PBI 00075285) (KU). **Oklahoma**: ***Caddo Co.***: Hinton, 35.47144°N 98.35561°W, 512 m, 19 Jul 1967, L.A. Kelton, 4♂ (AMNH_PBI 00103907–AMNH_PBI 00103910) (CNC). ***Cimarron Co.***: Regnier, 36.99396°N 102.85681°W, 1372 m, 06 Jun 1919–09 Jun 1919, collector unknown, 1♂ (AMNH_PBI 00101162), 1♀ (AMNH_PBI 00101167) (AMNH). ***Comanche Co.***: Fort Sill, 34.6659°N 98.38199°W, 344 m, 25 Apr 1954, J.C. Schaffner, 1♂ (AMNH_PBI 00105793) (TAMU). ***Garvin Co.***: Purdy, Co. line, Route 76, 28 May 2003, A.G. Wheeler, Jr., 1♀ (AMNH_PBI 00133859) (USNM). ***Pawnee Co.***: Pawnee County, 36.33333°N 96.75056°W, 15 Jul 1932, A.E. Pritchard, 1♂ (AMNH_PBI 00106783), 1♀ (AMNH_PBI 00106805) (USNM). ***Stephens Co.***: 0.3 km S of Garvin Co. line, on Route 76, 4.5 km S of Purdy, 28 May 2003, A.G. Wheeler, Jr., 2♀ (AMNH_PBI 00133857, AMNH_PBI 00133858) (USNM). **Texas**: ***Bell Co.***: Temple, 31.09823°N 97.34278°W, 219 m, 25 Apr 1933, S.E. McGregor, 1♂ (AMNH_PBI 00105990), 2♀ (AMNH_PBI 00106016, AMNH_PBI 00106017) (TAMU). ***Bosque Co.***: 2 mi S of Walnut Springs, 32.02847°N 97.74917°W, 04 May 1973, J.C. Schaffner, 2♂ (AMNH_PBI 00065321, AMNH_PBI 00065322) (JTP). 1♂ (AMNH_PBI 00105809), 3♀ (AMNH_PBI 00105824–AMNH_PBI 00105826) (TAMU); 21 May 1973, J.C. Schaffner, 2♀ (AMNH_PBI 00065327, AMNH_PBI 00065328) (JTP). 2♀ (AMNH_PBI 00105827, AMNH_PBI 00105828) (TAMU). 2 mi W of Iredell, 31.985°N 97.90575°W, 06 May 1970, J.C. Schaffner, 2♀ (AMNH_PBI 00105843, AMNH_PBI 00105844) (TAMU); 22 May 1970, J.C. Schaffner, 1♂ (AMNH_PBI 00105810) (TAMU); 03 May 1971, J.C. Schaffner, 1♂ (AMNH_PBI 00105813), 4♀ (AMNH_PBI 00105839–AMNH_PBI 00105842) (TAMU); 12 May 1971, J.C. Schaffner, 1♂ (AMNH_PBI 00105814) (TAMU); 28 Apr 1971, J.C. Schaffner, 2♂ (AMNH_PBI 00105815, AMNH_PBI 00105816), 1♀ (AMNH_PBI 00105838) (TAMU). 3 mi S of Walnut Springs, 32.01396°N 97.74917°W, 24 May 1973, J.C. Schaffner, 1♂ (AMNH_PBI 00065323) (JTP). 2♂ (AMNH_PBI 00105807, AMNH_PBI 00105808), 5♀ (AMNH_PBI 00105829–AMNH_PBI 00105833) (TAMU). 1♂ (AMNH_PBI 00106789), 1♀ (AMNH_PBI 00106809) (USNM); 02 May 1975, J.C. Schaffner, 3♂ (AMNH_PBI 00105821–AMNH_PBI 00105823) (TAMU). 3 mi W of Laguna Park, 31.85917°N 97.4305°W, 21 Apr 1972, J.C. Schaffner, 2♂ (AMNH_PBI 00105811, AMNH_PBI 00105812), 4♀ (AMNH_PBI 00105834–AMNH_PBI 00105837) (TAMU). ***Brewster Co.***: 1 mi W of Marathon, 30.205°N 103.26096°W, 12 Apr 1965, R.C. Dickson, 1♂ (AMNH_PBI 00083530) (UCR). 10 mi W of Alpine, 30.29149°N 103.79631°W, 31 May 1970, Hafernik and Murray, 1♂ (AMNH_PBI 00105970) (TAMU). 17 mi E of Alpine, 30.35801°N 103.37455°W, 15 Aug 1992, J.C. Schaffner, 1♂ (AMNH_PBI 00105971) (TAMU). ***Briscoe Co.***: 11 mi E of Silverton, 34.47402°N 101.11059°W, 31 May 2002, J.C. Schaffner, 1♀ (AMNH_PBI 00106035) (TAMU). ***Brown Co.***: Bangs, 31.71694°N 99.13222°W, 19 Apr 1939, collector unknown, 3♂ (AMNH_PBI 00106793–AMNH_PBI 00106795) (USNM); 06 Jun 1939, collector unknown, 2♀ (AMNH_PBI 00106810, AMNH_PBI 00106811) (USNM); 28 May 1941, L.S. Jones, 1♀ (AMNH_PBI 00106812) (USNM). ***Burnet Co.***: Longhorn Cavern State Park, 30.68407°N 98.3553°W, 417 m, 28 Apr 1968, J.C. Schaffner, 1♂ (AMNH_PBI 00105969) (TAMU). ***Coleman Co.***: Coleman, Horne Ranch [9 miles SW], 31.75178°N 99.50995°W, 19 May 1983, Gilreath-Hackler, 2♀ (AMNH_PBI 00106055, AMNH_PBI 00106056) (TAMU). ***Cottle Co.***: 11 mi N of Paducah, 34.17181°N 100.30167°W, 27 May 2002, J.C. Schaffner, 1♂ (AMNH_PBI 00106139), 3♀ (AMNH_PBI 00106117–AMNH_PBI 00106119) (TAMU). ***Crane Co.***: 12 mi W of Crane, 31.39706°N 102.55377°W, 19 Apr 1985, J.C. Schaffner, 2♀ (AMNH_PBI 00106053, AMNH_PBI 00106054) (TAMU). ***Crockett Co.***: 7 mi SE

of Sheffield, 30.66142°N 101.71054°W, 18 Jun 1984, S.J. Hanselmann, 2♀ (AMNH_PBI 00106048, AMNH_PBI 00106049) (TAMU). ***Culberson Co.***: Guadalupe Mountains National Park, Pine Springs Campground, 31.8946°N 104.82339°W, 1736 m, 25 Sep 1988, M.D. Schwartz, 2♂ (AMNH_PBI 00100841, AMNH_PBI 00100842) (AMNH). ***Donley Co.***: 6 mi NW of Clarendon on FM 3257, 34.9993°N 100.96285°W, 31 May 2002, J.C. Schaffner, 7♂ (AMNH_PBI 00106142–AMNH_PBI 00106148), 15♀ (AMNH_PBI 00106124–AMNH_PBI 00106138) (TAMU). ***Edwards Co.***: 22 mi S of Rocksprings, 29.69751°N 100.205°W, 30 Apr 1982, J.C. Schaffner, 2♀ (AMNH_PBI 00106021, AMNH_PBI 00106022) (TAMU). Rocksprings, 30.01576°N 100.2053°W, 732 m, 30 Apr 1983, J.C. Schaffner, 2♂ (AMNH_PBI 00105783, AMNH_PBI 00105993), 1♀ (AMNH_PBI 00105801) (TAMU). ***Gaines Co.***: 20 mi W of Lamesa, 32.70155°N 102.29797°W, 26 May 1997, W.F. Chamberlain, 2♀ (AMNH_PBI 00106050, AMNH_PBI 00106051) (TAMU). ***Gillespie Co.***: 18 m S of Llano, 30.49817°N 98.70571°W, 25 Apr 1993, W.F. Chamberlain, 1♂ (AMNH_PBI 00105994) (TAMU). 2 mi SE of Harper, 30.27918°N 99.22011°W, 11 Nov 1994, W.F. Chamberlain, 2♂ (AMNH_PBI 00105954, AMNH_PBI 00105968), 3♀ (AMNH_PBI 00105975–AMNH_PBI 00105977) (TAMU). 8 mi E of Fredericksburg, 30.2911°N 98.73696°W, 28 Apr 1971, V.V. Board, 2♂ (AMNH_PBI 00105988, AMNH_PBI 00105989), 1♀ (AMNH_PBI 00106015) (TAMU). ***Glasscock Co.***: 9 mi SE of Stanton, 32.03676°N 101.67899°W, 28 May 1973, Gaumer and Clark, 6♀ (AMNH_PBI 00106062–AMNH_PBI 00106067) (TAMU). ***Gray Co.***: Lefors, 35.43639°N 100.80528°W, 29 May 2002, J.C. Schaffner, 1♂ (AMNH_PBI 00106140), 4♀ (AMNH_PBI 00106120–AMNH_PBI 00106123) (TAMU). ***Hays Co.***: 5 mi W of San Marcos, 29.88303°N 98.02483°W, 19 Apr 1984, J.C. Schaffner, 14♂ (AMNH_PBI 00105731–AMNH_PBI 00105743, AMNH_PBI 00106106), 23♀ (AMNH_PBI 00105750–AMNH_PBI 00105772) (TAMU). ***Hemphill Co.***: Lake Marvin, 12 mi E of Canadian, 35.883°N 100.186°W, 28 May 2002, J. C. Schaffner, 7♂ (AMNH_PBI 00106149–AMNH_PBI 00106155), 19♀ (AMNH_PBI 00105712–AMNH_PBI 00105730) (TAMU). ***JeffDavis Co.***: 1.8 mi W of McDonald Observatory road on Highway 118, 30.69224°N 104.04783°W, 09 Aug 1992, W. Godwin and E. Riley, 1♂ (AMNH_PBI 00105953), 2♀ (AMNH_PBI 00105973, AMNH_PBI 00105974) (TAMU). 27.5 mi W of Fort Davis, 30.58724°N 104.3579°W, 18 Aug 1987, R. Wharton, 1♂ (AMNH_PBI 00105745), 1♀ (AMNH_PBI 00106052) (TAMU). 3 mi W of Fort Davis, Davis Mountains, 30.58°N 103.94°W, 30 Apr 1982, D.A. and J.T. Polhemus, 3♂ (AMNH_PBI 00065377–AMNH_PBI 00065379), 2♀ (AMNH_PBI 00065380, AMNH_PBI 00065381) (JTP). 6 mi SE of Fort Davis, 30.52645°N 103.82262°W, 11 Aug 1969, Board and Hafernik, 1♂ (AMNH_PBI 00106088) (TAMU). Fort Davis, 30.58806°N 103.89417°W, 27 Aug 1969, Board and Hafernik, 1♂ (AMNH_PBI 00106093) (TAMU). Nunn Hill, Davis Mountains, 30.75348°N 104.14352°W, 23 Jul 1950, R.F. Smith, 1♂ (AMNH_PBI 00101161) (AMNH). ***Kerr Co.***: 30 mi W of Mountain Home, 30.03905°N 99.86434°W, 21 May 1989, W.F. Chamberlain, 3♂ (AMNH_PBI 00105747–AMNH_PBI 00105749), 1♀ (AMNH_PBI 00105773) (TAMU). 4 mi E of Junction of Highway 83 and 39, 29.94707°N 99.62586°W, 09 Apr 1995, W.F. Chamberlain, 1♂ (AMNH_PBI 00106107) (TAMU). Hunt, 30.07056°N 99.3375°W, 01 May 1966, J.C. Schaffner, 4♂ (AMNH_PBI 00106099–AMNH_PBI 00106102), 1♀ (AMNH_PBI 00106113) (TAMU). Junction of Highways 39 and 187, 29.95328°N 99.55549°W, 03 May 1996, W.F. Chamberlain, 1♂ (AMNH_PBI 00105955), 4♀ (AMNH_PBI 00105979–AMNH_PBI 00105982) (TAMU). ***Kimble Co.***: 2 mi N London, 30.7057°N 99.57611°W, 17 Apr 1984, J.C. Schaffner, 3♂ (AMNH_PBI 00105784–AMNH_PBI 00105786), 2♀ (AMNH_PBI 00105802, AMNH_PBI 00105803) (TAMU). 5 mi. west of Harper, 30.29969°N 99.32796°W, 29 Apr 1983, J.C. Schaffner, 5♂ (AMNH_PBI 00105782, AMNH_PBI 00105960–AMNH_PBI 00105963), 1♀ (AMNH_PBI 00105985) (TAMU). 6.5 mi S of London, Llano River crossing, 30.58316°N 99.57574°W, 13 May 1977, Gillogly and Schaffner, 2♂ (AMNH_PBI 00105964, AMNH_PBI 00105965) (TAMU). Junction, 30.48917°N 99.77167°W, 29 Apr 1983, J.C. Schaffner, 7♂ (AMNH_PBI 00105777–AMNH_PBI 00105781, AMNH_PBI 00105966, AMNH_PBI 00105967), 6♀ (AMNH_PBI 00105796–AMNH_PBI 00105800, AMNH_PBI 00105984)

(TAMU). ***Llano Co.***: 13 mi W of Llano, 30.75898°N 98.89432°W, 23 Apr 1979, H. Burke, D. Delorme, J. C. Schaffner, 1♂ (AMNH_PBI 00106103), 2♀ (AMNH_PBI 00106114, AMNH_PBI 00106115) (TAMU). 3 mi NW of Valley Spring, 30.88983°N 98.85267°W, 20 Apr 1985, J.C. Schaffner, 1♂ (AMNH_PBI 00106105) (TAMU). Llano, 30.75917°N 98.67472°W, 01 Jun 1980, J.T. Polhemus, 1♂ (AMNH_PBI 00065631), 7♀ (AMNH_PBI 00065632–AMNH_PBI 00065638) (JTP). Valley Spring, 30.85934°N 98.81727°W, 397 m, 14 May 1966, P.K. Wagner, 1♂ (AMNH_PBI 00106057), 4♀ (AMNH_PBI 00106058–AMNH_PBI 00106061) (TAMU). ***Nolan Co.***: Sweetwater, 32.47083°N 100.40556°W, 07 May 1987, J. Cokeendolpher, 2♂ (AMNH_PBI 00243740, AMNH_PBI 00243741), 1♀ (AMNH_PBI 00243742) (FSCA). ***McCulloch Co.***: 10 mi S of Brady, 30.98985°N 99.33472°W, 12 May 2000, W.F. Chamberlain, 1♀ (AMNH_PBI 00106111) (TAMU). 2 mi NW of Voca, 31.02574°N 99.22291°W, 20 Apr 1985, J.C. Schaffner, 1♂ (AMNH_PBI 00105992), 3♀ (AMNH_PBI 00106018–AMNH_PBI 00106020) (TAMU). ***Motley Co.***: Matador, 34.01202°N 100.822°W, 726 m, 15 Jun 1933, H.G. Johnston, 16♀ (AMNH_PBI 00105995–AMNH_PBI 00106010) (TAMU). ***Potter Co.***: 1 mi N of Canadian River on Route 87, 35.47925°N 101.88666°W, 08 Jun 1980, J.T. Polhemus, 1♂ (AMNH_PBI 00065165), 4♀ (AMNH_PBI 00065166–AMNH_PBI 00065169) (JTP). Amarillo, 35.22199°N 101.8312°W, 28 Sep 1930, S.E. Jones, 1♂ (AMNH_PBI 00105987), 1♀ (AMNH_PBI 00106014) (TAMU); 16 Sep 1938, R.K. Fletcher, 1♂ (AMNH_PBI 00105986), 3♀ (AMNH_PBI 00106011–AMNH_PBI 00106013) (TAMU). ***Presidio Co.***: 12 mi S of Marfa, 30.13357°N 104.01861°W, 29 Sep 1966, C.L. Cole, 1♂ (AMNH_PBI 00106091) (TAMU). 5 mi N of Shafter, 29.89259°N 104.30278°W, 1219 m, 30 Apr 1982, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00065118) (JTP). 6 mi S of Marfa, 30.22068°N 104.01861°W, 13 Oct 1966, C.L. Cole, 1♀ (AMNH_PBI 00106109) (TAMU). 7 mi S of Marfa, 30.20616°N 104.01861°W, 08 Jun 1968, J.E. Hafernik, 2♂ (AMNH_PBI 00106089, AMNH_PBI 00106090), 1♀ (AMNH_PBI 00106108) (TAMU). Marfa, 30.30778°N 104.01861°W, 06 Jun 1908, Mitchell and Cushman, 1♀ (AMNH_PBI 00107121) (USNM). ***Reagan Co.***: 8 mi W of Big Lake, 31.19231°N 101.59598°W, 19 Apr 1989, J.C. Schaffner, 1♂ (AMNH_PBI 00105744) (TAMU). ***Real Co.***: 19 mi N of Leakey, 29.98056°N 99.69137°W, 09 May 1987, W.F. Chamberlain, 4♂ (AMNH_PBI 00105956–AMNH_PBI 00105959), 1♀ (AMNH_PBI 00105983) (TAMU). 28 mi SW of Hunt, 29.86788°N 99.68746°W, 07 Apr 1991, W.F. Chamberlain, 2♀ (AMNH_PBI 00106046, AMNH_PBI 00106047) (TAMU). 4 mi S of Garven Store, 30.00995°N 99.69139°W, 09 Apr 1995, W.F. Chamberlain, 1♂ (AMNH_PBI 00105792) (TAMU). ***Roberts Co.***: 20 mi NW of Miami, 35.89625°N 100.89034°W, 30 May 2002, J.C. Schaffner, 7♀ (AMNH_PBI 00106036–AMNH_PBI 00106042) (TAMU). ***San Saba Co.***: 15 mi NW of San Saba, 31.34939°N 98.89776°W, 15 May 1971, Board and Clark, 1♂ (AMNH_PBI 00106092) (TAMU). ***Shackelford Co.***: 10 mi W of Albany, 32.72321°N 99.46943°W, 12 May 2000, W.F. Chamberlain, 1♂ (AMNH_PBI 00106096), 1♀ (AMNH_PBI 00106110) (TAMU). ***Somervell Co.***: 10 mi W Glen Rose, 32.23432°N 97.92657°W, 04 May 1973, J.C. Schaffner, 1♂ (AMNH_PBI 00105819) (TAMU). 3 mi S of Glen Rose, 32.1909°N 97.755°W, 04 May 1973, J.C. Schaffner, 2♂ (AMNH_PBI 00105817, AMNH_PBI 00105818) (TAMU). 5 mi S of Glen Rose, 32.16188°N 97.755°W, 20 Jun 1973, J.C. Schaffner, 1♂ (AMNH_PBI 00105820) (TAMU). ***Sutton Co.***: 22 mi E of Sonora, 30.46638°N 100.29055°W, 11 Apr 2002, M.J. Yoder, 2♂ (AMNH_PBI 00106086, AMNH_PBI 00106087) (TAMU). ***Upton Co.***: 1 mi E of Rankin, 31.2225°N 101.92052°W, 19 Apr 1985, J.C. Schaffner, 1♂ (AMNH_PBI 00105746) (TAMU). ***Uvalde Co.***: Concan, 29.49523°N 99.71255°W, 116 m, 22 Apr 1994, W.F. Chamberlain, 1♂ (AMNH_PBI 00105789), 1♀ (AMNH_PBI 00105806) (TAMU). Junction of Highways 127 and US83, 29.50015°N 99.72225°W, 03 May 1996, W.F. Chamberlain, 1♀ (AMNH_PBI 00105978) (TAMU). ***Unknown Co.***: Liberty Hill, 17 May 1967, P.M. Wagner, 1♂ (AMNH_PBI 00105972) (TAMU). Plainview, 09 Nov 1930, S.E. Jones, 1♂ (AMNH_PBI 00105991), 1♀ (AMNH_PBI 00106023) (TAMU). **Wyoming**: ***Sheridan Co.***: Sheridan, 44.79722°N 106.95556°W, 06 Jul 1896, R.P. Currie, 1♂ (AMNH_PBI

00106797) (USNM). **Unknown state**: Unknown locality, 1♂ (AMNH_PBI 00106791) (USNM).

Hadronema simplex Knight
Figures 3, 26, 31, 33, 35

Hadronema (*Hadronema*) *simplex* Knight, 1928: 178 [n. sp.]; Carvalho, 1958: 69 [catalog]; Henry and Wheeler, 1988: 411 [catalog].

Hadronema simplex Kelton, 1980: 226 [diagnosis, distribution]; Schuh, 1995: 116 [catalog]; Maw et al., 2000: 117 [list].

DIAGNOSIS: Recognized by the unequal rami of the ventral spicule of the vesica (fig. 26, arrows); the long dorsal spicule (fig. 26, arrow); the dark coloration, in particular the posterior lobe of the pronotum (fig. 3); and the total length (table 1).

Hadronema simplex is most similar to *H. mexicanum*, but it is distinguished from *H. mexicanum* by the unequal rami and the usually darker posterior lobe of the pronotum. *Hadronema breviatum* and *H. sinuatum* have also unequal rami (fig. 26), but *H. simplex* is distinguished from them by the longer proximal rami and longer dorsal spicule; furthermore, *H. simplex* is distinguished from *H. breviatum* by the longer antennal segment II (table 1), and from *H. sinuatum* by the darker coloration (fig. 3).

REDESCRIPTION: *Male*: Medium-sized, total length 2.90–3.60. COLORATION: Black with red and white markings (fig. 3). HEAD: Black; clypeus with one basal and two longitudinal areas of irregular shiny spots; frons with two longitudinal areas of oblique lines composed of irregular shiny lines; vertex with two shiny spots anterior to the ocular ridge, area adjacent to the eyes reddish black; mandibular and maxillary plates usually reddish, suture between them bright red, sometimes both plates and suture darker; labrum shiny black; labium black, segment I weakly reddish, III–IV shiny black; antennae black. THORAX: Collar and anterior lobe of pronotum black, sometimes weakly reddish black at center; calli black with irregular shiny spots; posterior lobe of pronotum dark red, sometimes with pale posterior margin; mesoscutum black; scutellum black with transverse red black longitudinal marking, apex pale; proepisternum black; proepimeron anteriorly reddish black, posteriorly reddish with margin pale; mesepisternum and mesepimeron reddish black, mesopleural spiracle black; metepisternum black; venter black. *Hemelytra*: Clavus dark brown; corium mostly dark brown, anterior angle pale, costal margin white; cuneus mostly white, inner margin dark brown; membrane brown, veins dark brown. *Legs*: Black; basal portion of trochanters reddish. ABDOMEN: Black, posterior margin of sternites pale. GENITALIA: Genital capsule black; proctiger dark orange; parameres dark brown. STRUCTURE: THORAX: Metepisternum with evaporatory area reduced and peritreme enlarged. *Legs*: Profemur with basal projection bifid. GENITALIA: Genital capsule subtriangular, without round sensory lobe on left side, lateroventral prolongation on right side of medium size, blunt; insertion of parameres lateral; left paramere sickle-shaped; apex of right paramere narrowing apically, not acuminate; rami of ventral spicule unequal in length, distal ramus short, proximal about twice as long, latter reaching the middle of dorsal spicule, longer one denticulate apically (fig. 26); dorsal spicule about half as long as ventral spicule, denticulate, almost reaching the apex of short ramus of ventral spicule (fig. 26).

Female: Similar to male in coloration and structure, but longer and broader (fig. 3), total length 3.76–4.14. STRUCTURE: GENITALIA: Subgenital plate triangular, apex rounded; dorsal lobes of interramal sclerites narrow, long (fig. 31); sclerotized central area of anterior wall small, barely trapezoidal, transversely divided, ventral sclerite with a large, finely denticulate acuminate process, dorsal margin of dorsal sclerite with small denticles (fig. 33); accessory piece of sclerotized rings well sclerotized (fig. 31).

DISTRIBUTION: Ranging from the Prairie Provinces of Canada in the north through the Rocky Mountains south to Arizona and New Mexico (fig. 35).

HOSTS: There is little host-plant information available for *H. simplex*. The range of recorded plants is quite diverse, however: Cactaceae, Fabaceae (*Medicago* sp.), Iridaceae, Poaceae, and Scrophulariaceae, with most of the records being on Iridaceae and Scrophulariaceae. In all cases just a few

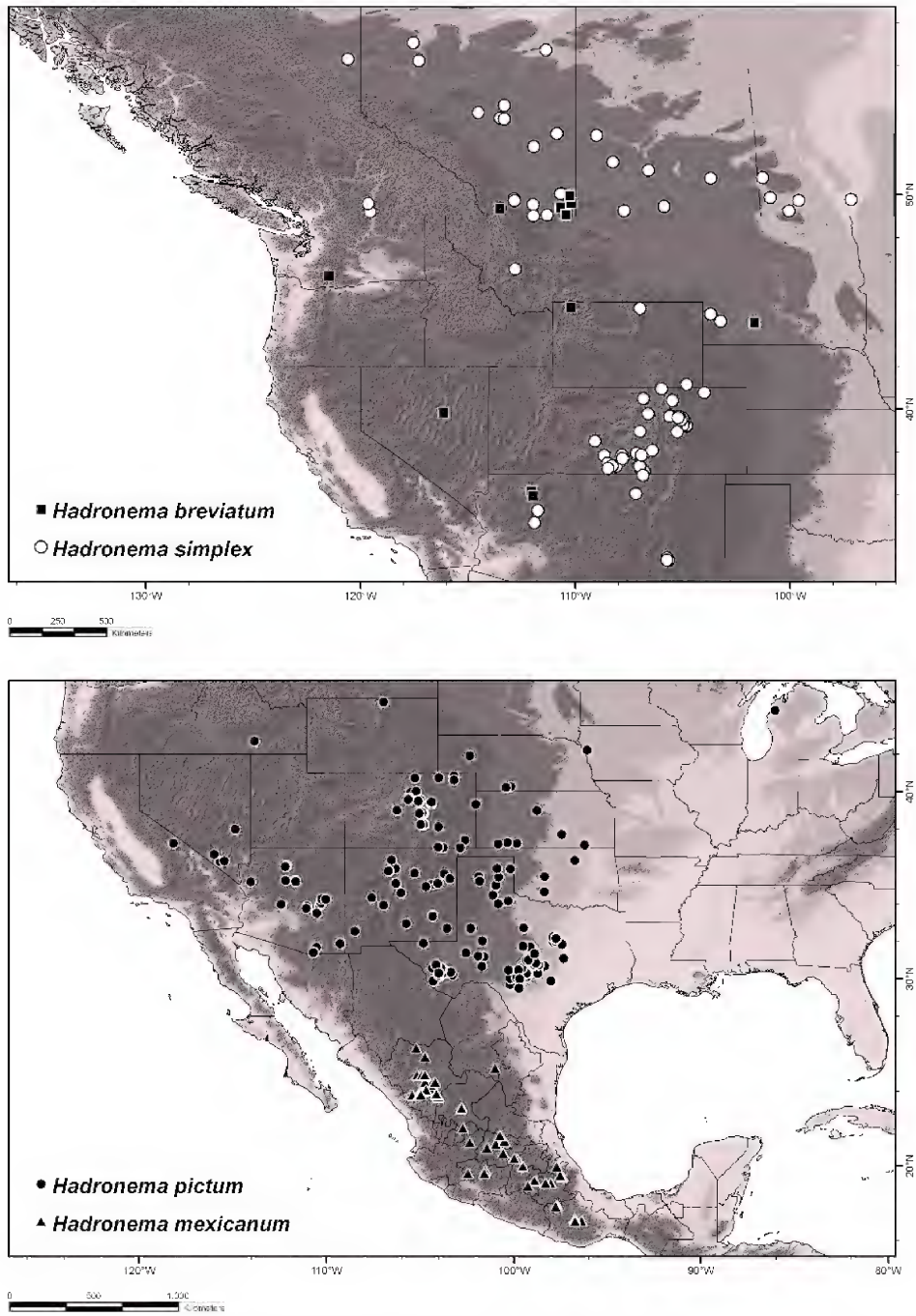

Fig. 35. Distribution maps for *Hadronema breviatum*, *H. simplex*, *H. pictum*, and *H. mexicanum*.

specimens are known for each record. Because no large series have been taken on any of these plants, it is safe to assume that true host plants have not been found yet. It is probable that the reason for having such a variety of plants is the collecting method. General sweeping undoubtedly accounts for several herbaceous plants erroneously recorded as "hosts". Nonetheless, some of these plants may be in fact meloid host plants (e.g.,

Iris for *Epicauta*, see Pinto, 1991), but this requires further fieldwork.

DISCUSSION: Knight (1928) described *H. simplex* as being similar to *H. militare* but smaller, without a ventral cleft on the genital capsule, and with a different paramere structure. *Hadronema simplex* shares with *H. militare* a reduced metathoracic evaporatory area. Nonetheless, *H. simplex* may be more related to *H. breviatum* based on a similar shape of the genital capsule and sickle-shaped left paramere. Dark body coloration also occurs in several species of *Hadronema* (see figs. 2, 3).

HOLOTYPE MALE: **USA**: **Wyoming**: ***Park Co.***: Yellowstone National Park, [44.76667°N 110.23333°W], 08 Aug 1927, H.H. Knight, Holotype (by H.H. Knight) "*Hadronema simplex*", H.H. Knight coll. 1976, 1♂ (AMNH_PBI 00070383) (USNM).

PARATYPES: **CANADA**: **Alberta**: Lethbridge, 49.7°N 112.83333°W, W. Carter, 1♂ (AMNH_PBI 00106766) (USNM). **USA**: **Wyoming**: ***Laramie Co.***: Cheyenne, 41.13998°N 104.82024°W, 1856 m, Jun 1907–Aug 1907, F.T. Hartman, 1♀ (AMNH_PBI 00106777) (USNM). ***Park Co.***: Yellowstone National Park, 44.76667°N 110.23333°W, 08 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00103766), 1♀ (AMNH_PBI 00104656) (CNC). 1♂ (AMNH_PBI 00106767), 1♀ (AMNH_PBI 00106778) (USNM). Yellowstone National Park, 44.76667°N 110.23333°W, 08 Aug 1927, H.H. Knight, 1♂ (AMNH_PBI 00105590) (TAMU).

OTHER SPECIMENS EXAMINED: **CANADA**: **Alberta**: Battler River, 52.23333°N 111.93333°W, 17 Jul 1940, C.L. Neilson, 1♀ (AMNH_PBI 00104658) (CNC). Clyde, 54.15°N 113.31666°W, 12 Jul 1939, R.W. Salt, *Medicago* sp. (Fabaceae), 1♂ (AMNH_PBI 00104615) (CNC). Conrad, 49.52°N 111.97°W, 21 Jun 1952, A.R. Brooks, 2♂ (AMNH_PBI 00104605, AMNH_PBI 00104606) (CNC). Coutts, 49°N 111.95°W, 15 Jun 1952, A.R. Brooks, 1♀ (AMNH_PBI 00104651) (CNC). Diamond City, 49.8°N 112.85°W, 08 Jul 1956, O. Peck, *Opuntia* sp. (Cactaceae), 1♀ (AMNH_PBI 00104673) (CNC). Edmonton, 53.55°N 113.5°W, 05 Aug 1952, L.A. Konotopetz, 1♀ (AMNH_PBI 00104661) (CNC). Gilchrist Ranch, Aden, 49.03333°N 111.31666°W, 28 Jun 1956, O. Peck, *Medicago* sp. (Fabaceae), 1♂ (AMNH_PBI 00104616) (CNC). Glenevis, 53.8°N 114.51666°W, 25 Aug 1939, R.W. Salt, 1♀ (AMNH_PBI 00104650) (CNC). Glenwood, 49.36666°N 113.51666°W, 01 Jul 1939, R.W. Salt, 1♂ (AMNH_PBI 00104620) alfalfa, 1♂ (AMNH_PBI 00104619) (CNC). Hotchkiss, 57.06666°N 117.55°W, 17 Jul 1940, C.L. Neilson, 1♂ (AMNH_PBI 00104617) (CNC). Lethbridge, 49.7°N 112.83333°W, 20 Jun 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00104604) alfalfa, 1♂ (AMNH_PBI 00104618) (CNC). McMurray, 56.73333°N 111.38333°W, 07 Aug 1953, G.E. Ball, 2♀ (AMNH_PBI 00104648, AMNH_PBI 00104649) (CNC); 30 Jun 1953, W.J. Brown, 1♂ (AMNH_PBI 00104613), 1♀ (AMNH_PBI 00104647) (CNC). Medicine Hat, 50.03333°N 110.68333°W, 20 Jun 1938, R.W. Salt, *Medicago* sp. (Fabaceae), 1♀ (AMNH_PBI 00104674) (CNC). Onefour, 49.06666°N 110.45°W, 14 Jun 1952, L.A. Konotopetz, 2♀ (AMNH_PBI 00104645, AMNH_PBI 00104659) (CNC); 13 Jun 1956, O. Peck, *Agropyron juncea* (Poaceae), 1♀ (AMNH_PBI 00104639) (CNC); 14 Jun 1952, A.R. Brooks, 1♂ (AMNH_PBI 00104609), 5♀ (AMNH_PBI 00104640–AMNH_PBI 00104644) (CNC). Peace River, 56.23333°N 117.28333°W, 10 Jul 1961, A.R. Brooks, 1♂ (AMNH_PBI 00104612), 3♀ (AMNH_PBI 00104653–AMNH_PBI 00104655) (CNC); 11 Jun 1961, A.R. Brooks, 1♂ (AMNH_PBI 00104611) (CNC). Sherwood Park, 53.51666°N 113.31666°W, 01 Jul 1989–06 Jul 1989, C. and A. von Nidek, 3♂ (AMNH_PBI 00190048, AMNH_PBI 00190058, AMNH_PBI 00190059), 1♀ (AMNH_PBI 00190063) (ZMAN). Wainwright, 52.83333°N 110.86666°W, 27 Jul 1957, A. and J. Brooks, 5♀ (AMNH_PBI 00104668–AMNH_PBI 00104672) (CNC). **British Columbia**: Cecil Lake, 56.3°N 120.58333°W, 15 Jun 1961, A.R. Brooks, 1♂ (AMNH_PBI 00103754), 1♀ (AMNH_PBI 00103765) (CNC). Oliver, McIntyre Creek, 49.18333°N 119.55°W, 04 Jul 1959, L.A. Kelton, 6♂ (AMNH_PBI 00103756–AMNH_PBI 00103760, AMNH_PBI 00103755), 3♀ (AMNH_PBI 00103762–AMNH_PBI 00103764) (CNC). Summerland, 49.56646°N 119.63951°W, 400 m, 12 Jul 1975, L.A. Kelton, 1♂ (AMNH_PBI 00103761) (CNC). **Manitoba**: 67.4 km E of junction of Routes 2 and 3 on Route 2, 49.77°N 97.17°W, 229 m, 08 Jul 1990, M.D. Schwartz and R. Foottit, (Fabaceae), 1♂ (AMNH_PBI 00104623) (CNC).

Aweme, 49.72°N 99.6°W, 09 Jul 1930, R.M. White, 1♂ (AMNH_PBI 00104621) (CNC). Boissevain, 49.23333°N 100.05°W, 20 Jul 1953, Brooks and Kelton, 1♀ (AMNH_PBI 00104657) (CNC). Russell, 50.78333°N 101.28333°W, 17 Jul 1954–21 Jul 1954, Brooks and Wallis, 5♂ (AMNH_PBI 00104600–AMNH_PBI 00104603, AMNH_PBI 00105195), 3♀ (AMNH_PBI 00104630–AMNH_PBI 00104632) (CNC). Virden, 49.85°N 100.93333°W, 10 Jul 1953, Brooks and Kelton, 3♀ (AMNH_PBI 00104635–AMNH_PBI 00104637) (CNC); 12 Jul 1953, Brooks and Kelton, 1♂ (AMNH_PBI 00104608) (CNC); 08 Jul 1953, Brooks and Kelton, 1♀ (AMNH_PBI 00104638) (CNC). **Saskatchewan**: Cut Knife, 52.75°N 109.01666°W, 21 Jun 1940, A.R. Brooks, 1♂ (AMNH_PBI 00104622) (CNC). Elbow, 51.11666°N 106.6°W, 20 Jun 1960, A.R. Brooks, 1♂ (AMNH_PBI 00104614), 1♀ (AMNH_PBI 00104652) (CNC); 02 Aug 1951, L.A. Konotopetz, 1♀ (AMNH_PBI 00104662) (CNC). Lebret, 50.75°N 103.7°W, 05 Jul 1951, L.A. Konotopetz, 1♂ (AMNH_PBI 00104607), 2♀ (AMNH_PBI 00104633, AMNH_PBI 00104634) (CNC). McGee, 51.5°N 108.25°W, 03 Jul 1952, L.A. Konotopetz, 2♀ (AMNH_PBI 00104660, AMNH_PBI 00104664) (CNC). Saint Victor, 49.43305°N 105.86666°W, 25 Jun 1955, A.R. Brooks, 1♂ (AMNH_PBI 00104610), 1♀ (AMNH_PBI 00104646) (CNC). Val Marie, 49.23333°N 107.73333°W, 08 Aug 1955, A.R. Brooks, 1♀ (AMNH_PBI 00104663) (CNC). **USA**: **Arizona**: ***Coconino Co.***: 7.5 mi NW of Flagstaff, 35.27°N 111.74°W, 30 Jun 1964, R.W. Poole, 2♂ (AMNH_PBI 00125457, AMNH_PBI 00125458), 4♀ (AMNH_PBI 00125459–AMNH_PBI 00125462) (CUIC). ***Yavapai Co.***: 2 mi NE of Sheeps Crossing, White Mountains, Greer Recreation Area, 34.69127°N 111.91291°W, 07 Jul 1983, J.D. Pinto, *Iris* sp. (Iridaceae), 8♀ (AMNH_PBI 00083500–AMNH_PBI 00083507) (UCR). **Colorado**: ***Archuleta Co.***: 17 mi SE of Pagosa Springs, 37.09°N 106.79°W, 18 Jun 1972, G.C. Gaumer, 2♂ (AMNH_PBI 00105674, AMNH_PBI 00105675), 11♀ (AMNH_PBI 00105689, AMNH_PBI 00105690, AMNH_PBI 00105696–AMNH_PBI 00105703, AMNH_PBI 00106033) (TAMU). Pagosa Springs, F 4362, 37.26666°N 107°W, 2195 m, 22 Jun 1919–24 Jun 1919, collector unknown, 2♂ (AMNH_PBI 00100848, AMNH_PBI 00100849), 1♀ (AMNH_PBI 00100854) (AMNH). 1♂ (AMNH_PBI 00106760) (USNM). Rt 160, 5 mi N of Pagosa Springs, 37.34172°N 107.00917°W, 27 Jun 1980, K. and R. Schmidt, *Penstemon strictiformis* Rydb. (Scrophulariaceae), det. N.H. Holmgren 1980, 2♂ (AMNH_PBI 00100846, AMNH_PBI 00100847), 4♀ (AMNH_PBI 00100850–AMNH_PBI 00100853) (AMNH). ***Clear Creek Co.***: Doolittle Ranch, Mount Evans, 39.67528°N 105.60056°W, 2987 m, 21 Jul 1961, B.H. Poole, 1♂ (AMNH_PBI 00104628) (CNC); 14 Jul 1961, J.R. Stainer, 1♂ (AMNH_PBI 00104629) (CNC). Echo L. 10, Mount Evans, 39.65832°N 105.60333°W, 183 m, 20 Jul 1961, B.H. Poole, 1♂ (AMNH_PBI 00104627) (CNC). ***Dolores Co.***: 29 mi SW of Norwood, 37.8341°N 108.66702°W, 07 Jul 1980, J.T. and D.A. Polhemus, 1♂ (AMNH_PBI 00065001), 1♀ (AMNH_PBI 00065002) (JTP). ***Douglas Co.***: 2 mi E of Greenland, 39.18249°N 104.81731°W, 03 Jul 1979, D.A. Polhemus, 6♂ (AMNH_PBI 00064966–AMNH_PBI 00064971), 4♀ (AMNH_PBI 00064943, AMNH_PBI 00064974–AMNH_PBI 00064976) (JTP). 3 mi E of Larkspur, 39.22861°N 104.83068°W, 03 Jul 1979, D.A. Polhemus, 5♂ (AMNH_PBI 00065420–AMNH_PBI 00065424), 5♀ (AMNH_PBI 00064924, AMNH_PBI 00065426–AMNH_PBI 00065429) (JTP). Chatfield State Park, 39.53666°N 105.06888°W, 03 Jun 1992, J.T. Polhemus, 1♂ (AMNH_PBI 00065411) (JTP). Daniels Park, 39.48139°N 104.92528°W, 02 Jul 1979, D.A. Polhemus, 1♂ (AMNH_PBI 00065337), 1♀ (AMNH_PBI 00064944) (JTP). Head ofHighline Canal, 39.56168°N 104.99692°W, 11 Jun 1979, J.T. Polhemus, 1♀ (AMNH_PBI 00064937) (JTP). Perry Park, 39.25667°N 104.99194°W, 30 Jul 1977, J.T. and D.A. Polhemus, 2♀ (AMNH_PBI 00065412, AMNH_PBI 00065413) (JTP). Roxborough Park Road near Chatfield State Park, 39.47389°N 105.08472°W, 1707 m, 01 Jun 1981, J.T. Polhemus, 1♂ (AMNH_PBI 00065372) (JTP). Waterton, 39.49361°N 105.08806°W, 18 Jun 1981, D.A. Polhemus, 1♂ (AMNH_PBI 00065401) (JTP); 04 Jun 1981, D.A. Polhemus, 1♂ (AMNH_PBI 00065400) (JTP); 15 Jun 1981, D.A. Polhemus, 1♂ (AMNH_PBI 00064988) (JTP); 11 Jun 1981, D.A. Polhemus, 1♂ (AMNH_PBI 00064987) (JTP); 25 May 1982, D.A. Polhemus, 1♂ (AMNH_PBI 00065320) (JTP); 22 Jun 1981,

D.A. Polhemus, 1♀ (AMNH_PBI 00065402) (JTP). ***Eagle Co.***: Muddy Pass, 39.76722°N 106.60527°W, 2682 m, 15 Aug 1961, J.E.R. Stainer, 1♀ (AMNH_PBI 00104665) (CNC). ***Gunnison Co.***: Gothic, 38.95917°N 106.98917°W, 19 Jul 1963, O.R. Taylor, 1♀ (AMNH_PBI 00102046) (AMNH). ***Hinsdale Co.***: 1.5 mi N of Continental Reservoir, 37.9°N 107.206°W, 04 Jul 1976–07 Jul 1976, J.W. Holmes, 1♂ (AMNH_PBI 00106031) (TAMU). 3 mi S Spring Creek Pass, 37.94083°N 107.15921°W, 3018 m, 06 Aug 1997, J.C. Schaffner, 2♂ (AMNH_PBI 00105775, AMNH_PBI 00105776) (TAMU). ***Jefferson Co.***: North Turkey Creek Park near Tenders, 39.59468°N 105.22014 °W, 16 Jul 1983, R.T. Schuh, D.A. and J.T. Polhemus, 1♂ (AMNH_PBI 00102748) (AMNH). Morrison, 39.65361°N 105.19056°W, 1757 m, 06 Jun 1952, R.S. Beal, 1♂ (AMNH_PBI 00079885) (UCB). ***La Plata Co.***: 9 mi E Mancos, 37.32°N 108.12°W, 04 Jun 1972, W.E. Clark, 1♂ (AMNH_PBI 00105794) (TAMU). ***Larimer Co.***: Estes Park, 40.39361°N 105.49417°W, 2286 m, 10 Aug 1961, J.R. Stainer, 1♀ (AMNH_PBI 00104666) (CNC); 07 Jun 1956, R. and K. Dreisbach, 1♀ (AMNH_PBI 00107023) (USNM). Forrester's Ranch (Colo. 2013), 40.93952°N 105.98546°W, 03 Aug 1896, C.F. Baker, 1♂ (AMNH_PBI 00106774) (USNM). ***Mineral Co.***: Creede, 37.84917°N 106.92583°W, 04 Jul 1977, J.T. Polhemus, 2♂ (AMNH_PBI 00064963, AMNH_PBI 00064964) (JTP); 06 Jul 1937, R.H. Beamer, 1♀ (AMNH_PBI 00075287) (KU). ***Montezuma Co.***: Dolores, 37.47389°N 108.50389°W, 15 Aug 1925, H.H. Knight, 12♀ (AMNH_PBI 00107011–AMNH_PBI 00107022) (USNM). Mancos, 37.345°N 108.28861°W, 13 Aug 1925, C.J. Drake, 1♀ (AMNH_PBI 00106776) (USNM). Mesa Verde National Park, Praoter Canyon, 37.23333°N 108.47972°W, 2325 m, 22 Jul 1963, O.R. Taylor, 2♀ (AMNH_PBI 00102047, AMNH_PBI 00102048) (AMNH). ***Routt Co.***: Steamboat Springs, 40.485°N 106.83111°W, 2042 m, 15 Jul 1964–16 Jul 1964, H.H. Knight, 5♂ (AMNH_PBI 00106761–AMNH_PBI 00106765) (USNM); 16 Jul 1964, H.H. Knight, 1♀ (AMNH_PBI 00106779) (USNM). ***San Juan Co.***: San Juan National Forest, Chimney Rock, 37.69167°N 107.80833°W, 15 Jul 1991, W.F. Chamberlain, 1♀ (AMNH_PBI 00106032) (TAMU). Near Ophir, 37.85694°N 107.83194°W, 2591 m, 07 Jul 1980, J.T. Polhemus, 2♂ (AMNH_PBI 00065003, AMNH_PBI 00065004), 2♀ (AMNH_PBI 00065005, AMNH_PBI 00065006) (JTP). ***Teller Co.***: 2 mi SE of Florissant, 38.92533°N 105.26253°W, 04 Jul 1998, A.L. Hicks, 2♂ (AMNH_PBI 00106772, AMNH_PBI 00106773) (USNM). ***Weld Co.***: 8 mi N of Nunn, Pawnee National Grassland, 40.75277°N 104.00333°W, 1969, collector unknown, 1♀ (AMNH_PBI 00065172) (JTP). ***Unknown Co.***: Central South Park, 38.07381°N 106.41141°W, 2743 m, 21 Jun 1961, J.E.R. Stainer, 1♀ (AMNH_PBI 00104667) (CNC). **Montana**: ***Powell Co.***: Garrison, 46.52326°N 112.8117°W, 1333 m, 10 Jul 1935, Oman, 1♂ (AMNH_PBI 00106769) (USNM). **New Mexico**: ***Otero Co.***: 2 mi E of Cloudcroft, 32.95722°N 105.70748°W, 17 Jul 1979, Delorme, Mc Hugh, Schaffner, 1♂ (AMNH_PBI 00105602), 3♀ (AMNH_PBI 00105603–AMNH_PBI 00105605) (TAMU). 4 mi E of Cloudcroft, 32.95722°N 105.67302°W, 17 Jul 1979, Delorme, McHugh, Schaffner, 4♀ (AMNH_PBI 00105691–AMNH_PBI 00105694) (TAMU); 18 Aug 1979–18 Aug 1979, Delorme, McHugh, Schaffner, 1♀ (AMNH_PBI 00105695) (TAMU); 22 Jun 1979, Delorme, McHugh, Carrola, Friedlander, Schaffner, 1♂ (AMNH_PBI 00064960), 1♀ (AMNH_PBI 00064961) (JTP). 6♂ (AMNH_PBI 00105623, AMNH_PBI 00105624, AMNH_PBI 00105670–AMNH_PBI 00105673), 16♀ (AMNH_PBI 00105626, AMNH_PBI 00105627, AMNH_PBI 00105676–AMNH_PBI 00105688, AMNH_PBI 00105774) (TAMU). 7 mi N of Cloudcroft, 33.05841°N 105.74194°W, 13 Aug 1982, J.C. Schaffner, 1♂ (AMNH_PBI 00105625), 2♀ (AMNH_PBI 00105628, AMNH_PBI 00105629) (TAMU). Cloudcroft, 32.95722°N 105.74194°W, 2774 m, 27 Jun 1940, R.H. Beamer, 1♀ (AMNH_PBI 00075288) (KU). Cloudcroft, 32.95731°N 105.7424°W, 2642 m, 07 Jun 1933, P.W. Oman, 1♀ (AMNH_PBI 00106775) (USNM). ***Rio Arriba Co.***: 10 mi E of Dulce, 36.90257°N 106.84941°W, 2282 m, 14 Jun 1992, W.F. Chamberlain, 1♂ (AMNH_PBI 00105622) (TAMU). Monero, 36.90195°N 106.8553°W, 2223 m, 22 Jun 1961, G.M. Chamberlain, 1♀ (AMNH_PBI 00106034) (TAMU). ***Sandoval Co.***: 1 mi N of Cuba, 36.05709°N 107.19319°W, 2237 m, 04 Jun 1972, W.E. Clark, 1♀ (AMNH_PBI 00105704) (TAMU). **South Dakota**: ***Lawrence Co.***: Black Hills, 44.41667°N 103.70833°W, 29 Jun 1973,

L.A. Kelton, 1♂ (AMNH_PBI 00104624) (CNC); 28 Jun 1973, L.A. Kelton, 2♂ (AMNH_PBI 00104625, AMNH_PBI 00104626) (CNC). ***Pennington Co.***: Rapid City, 44.08055°N 103.23111°W, 988 m, 25 Jun 1923, H.C. Severin, 2♂ (AMNH_PBI 00106770, AMNH_PBI 00106771) (USNM); 24 Jun 1923, H.C. Severin, 1♀ (AMNH_PBI 00106780) (USNM). **Utah**: ***San Juan Co.***: Geyser Creek, near Taylor Flats, 38.49469°N 109.09081°W, 04 Jul 1980, J.T. and D.A. Polhemus, 1♀ (AMNH_PBI 00065171) (JTP). **Wyoming**: ***Sheridan Co.***: Big Horn, 44.6833°N 106.9922°W, 1240 m, 09 Jul 1896, R.P. Currie, 2♀ (AMNH_PBI 00107029, AMNH_PBI 00107030) (USNM).

Hadronema sinuatum Knight
Figures 3, 26, 31, 33, 36

Hadronema (*Hadronema*) *sinuata* Knight, 1928: 179 [n. sp.]; Carvalho, 1958: 69 [catalog].

Hadronema sinuata: Knight, 1968: 95 [diagnosis, distribution]; Schuh, 1995: 116 [catalog].

Hadronema sinuatum: Steyskal, 1973: 207 [emendation].

Hadronema (*Hadronema*) *sinuatum*: Henry and Wheeler, 1988: 411 [catalog].

DIAGNOSIS: Recognized by the orange coloration; the completely orange posterior femora (fig. 3); the normally developed evaporatory area; the subtriangular genital capsule; the unequal short rami of the ventral spicule not reaching the apex of the dorsal spicule (fig. 26, arrow); and the short dorsal spicule (fig. 26, arrow).

Hadronema sinuatum is most similar to *H. bispinosum* in the overall pale coloration of the body. *Hadronema sinuatum* is distinguished from it by the dark abdomen, which is yellowish in *H. bispinosum*, the posterior femur orange without dark spots (fig. 3), which in *H. bispinosum* has a subapical dark spot (fig. 2), and the unequal short rami (fig. 26), which are longer and subequal in *H. bispinosum* (fig. 26). *Hadronema breviatum* and *H. simplex* also have unequal rami. *Hadronema sinuatum* is distinguished from both by the paler coloration, from *H. simplex* by the relatively shorter length of the dorsal spicule, and from *H. breviatum* by the bases of rami close to each other.

REDESCRIPTION: *Male*: Medium-sized, total length 3.13–3.46. COLORATION: Orange with white and black markings (fig. 3). HEAD: Orange; clypeus apically black, sometimes laterally dark, with two lateral and one basal shiny orange spot; frons with two longitudinal black markings and oblique shiny black lines, black markings sometimes connected posteriorly, longitudinal markings nearly connected with posterior transverse black band on vertex; broad transverse black band at the base of the head covering transverse carina and adjacent areas; neck black; base of mandibular plate sometimes pale, apex of maxillary plate dark orange; black line connecting base of mandibular and maxillary suture to antennal socket and eye; labrum shiny black; labial segments I–II yellowish orange, sometimes apically pale, III–IV black; antennae black, scapus sometimes orange brown. THORAX: Collar yellowish; pronotum orange; calli black, with scattered black shiny spots; posterior lobe of pronotum fading posteriorly to yellowish, or more darkly colored, sometimes posterior margin white; mesoscutum brown or orange brown; scutellum dark, sometimes distal half yellowish, insertion of setae brown; proepisternum and proepimeron orange, the latter posteriorly yellowish white, with black spot at base of the propleural suture; mesepisternum, mesepimeron, and metepisternum dark brown, dorsal margin weakly more yellowish; mesothoracic spiracle black; prosternum yellowish white; mesosternum dark brown. *Hemelytra*: Clavus brown; corium whitish with a large central dark brown spot, not reaching costal margin, dark spot sometimes more extensive; membrane brown with dark brown veins; sometimes a dark brown marking evident on the outer margin of the membrane posteriad to cells. *Legs*: Coxae orange, black at base; metacoxa with caudal surface dark; trochanters orange, weakly brown at center; femora orange, basally weakly darker, with lateral dark spots, more evident on profemur; basal projection of profemur dark brown; protibia orange, black at apex, meso- and metatibia black, pale orange at base; tarsi and claws black. ABDOMEN: Tergites brown; sternites dark brown, posterior margin yellowish white. GENITALIA: Genital capsule dark brown; parameres brown; proctiger yellowish, apex and ventral surface brown. STRUCTURE: THORAX:

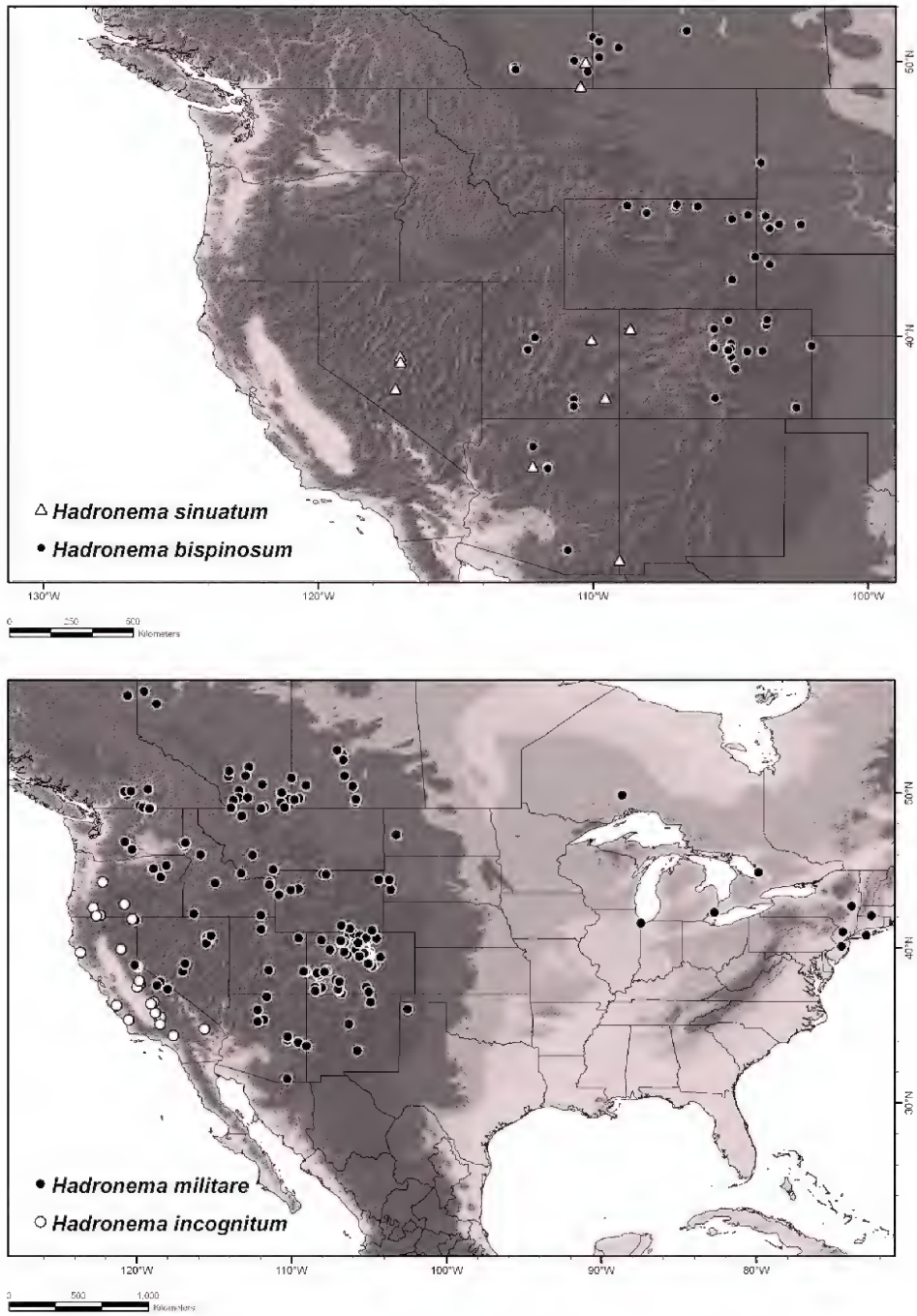

Fig. 36. Distribution maps for *Hadronema sinuatum*, *H. bispinosum*, *H. militare*, and *H. incognitum*.

Metepisternum with evaporatory area rounded on dorsal margin and peritreme large. *Legs*: Profemur with basal process bifid. GENITALIA: Genital capsule subtriangular, without sensory lobe on left side, lateroventral projection on right side of medium size, blunt, not projecting; paramere insertions lateral; left paramere sickle-shaped; apex of right paramere greatly acute; rami of ventral spicule unequal in size, short, barely reaching

apex of dorsal spicule (fig. 26); dorsal spicule short, nearly less than a third the length of ventral spicule, denticulate apically (fig. 26, arrow).

Female: Coloration and structure similar to male, but larger and broader (fig. 3), total length 3.76–3.91. COLORATION: Subgenital plate dark brown; ovipositor pale, apically darkened; dorsal area from spiracles sometimes orange. STRUCTURE: GENITALIA: Subgenital plate triangular, weakly truncate, barely reaching the middle of sternite VIII; dorsal lobes of interramal sclerites narrow, almost delicate (fig. 31); sclerotized central area of anterior wall small, nearly ovate, transversely divided, dorsal part with one blunt tubercle, tubercle on ventral part small, weakly developed (fig. 33); accessory sclerite of sclerotized rings very small, weakly sclerotized (fig. 31).

DISTRIBUTION: Ranging from Canada (southern Alberta) south to the Rocky Mountains and the Great Basin, to Arizona and New Mexico (fig. 36).

HOSTS: Most specimens of *H. sinuatum* have been found on *Atriplex canescens* (Chenopodiaceae). This is somewhat atypical for species of *Hadronema* in which most of them are found chiefly on Asteraceae or Fabaceae species. Only a few specimens were found on *Dalea* sp. (Fabaceae).

DISCUSSION: Knight (1928) considered this species "suggestive of *splendida*" (i.e., *H. splendida*, see *Origonema*). Nevertheless, the two are considered here not to be congeneric based on male and female genitalic characters. Knight described *H. sinuatum* as a distinct species based on the rather sinuate posterior margin of the pronotum of the single female examined. However, examination of additional material showed that this character might be variable and easily confused with *H. bispinosum*. Furthermore, a sinuate posterior margin of the pronotum may occur in other *Hadronema* species, even within the same population. Nevertheless, the structure of the rami in the vesica, host association, and overall coloration, in particular the posterior femora, provide evidence for considering *H. sinuatum* as a valid species different from *H. bispinosum*.

HOLOTYPE FEMALE: **USA**: **Arizona**: ***Coconino Co.***: Williams, [35.24944°N 112.19028°W], 2134 m, 24 Jun 1925, A.A. Nichol, Holotype (by H. H. Knight) "*Hadronema sinuatus*" (sic), H.H. Knight coll. 1976, 1♀ (AMNH_PBI 00070387) (USNM).

OTHER SPECIMENS EXAMINED: **CANADA**: **Alberta**: Irvine, 49.95°N 110.26666°W, 11 Jun 1952, L.A. Konotopetz, 1♂ (AMNH_PBI 00103942) (CNC). Onefour, 49.06666°N 110.45°W, 14 Jun 1952, L.A. Konotopetz, 1♀ (AMNH_PBI 00103943) (CNC). **USA**: **Colorado**: ***Moffat Co.***: Massadona, 40.25278°N 108.63972°W, 01 Jul 1931, R.H. Beamer, 2♀ (AMNH_PBI 00075241, AMNH_PBI 00075242) (KU). **Nevada**: ***Lander Co.***: 11 mi S of Route 50 on route 376, T17N R44E, 39.25817°N 117.01958°W, 1768 m, 28 Jun 1983, R.T. Schuh and M.D. Schwartz, *Atriplex canescens* (Pursh) Nutt. (Chenopodiaceae), 3♂ (AMNH_PBI 00101174–AMNH_PBI 00101176), 4♀ (AMNH_PBI 00101177–AMNH_PBI 00101179, AMNH_PBI 00102642) (AMNH). ***Nye Co.***: 2 mi E of Tonopah, 38.06722°N 117.19244°W, 1890 m, 07 Jun 1966, W. Gagne, *Dalea* sp. (Fabaceae), 1♂ (AMNH_PBI 00080030), 4♀ (AMNH_PBI 00080031–AMNH_PBI 00080034) (UCB); 08 May 1966, W. Gagne, 2♀ (AMNH_PBI 00080035, AMNH_PBI 00080036) (UCB). Northumberland Canyon Rd, Toquima Ranges, T14N R44E S31, 39.04652°N 117.00091°W, 1951 m, 28 Jun 1983, R.T. Schuh and M.D. Schwartz, 1♀ (AMNH_PBI 00101180) (AMNH). **New Mexico**: ***Hidalgo Co.***: Rodeo, 31.83528°N 109.03056°W, 1250 m, 02 Jul 1947, R.H. Beamer, 1♀ (AMNH_PBI 00075243) (KU). **Utah**: ***Duchesne Co.***: 23.7 mi S of Myton, Well's Draw, T10S R15E, 39.85181°N 110.06111°W, 1829 m, M.D. Schwartz, *Atriplex canescens* (Pursh) Nutt. (Chenopodiaceae), 7♂ (AMNH_PBI 00101181–AMNH_PBI 00101186, AMNH_PBI 00102637), 12♀ (AMNH_PBI 00101189–AMNH_PBI 00101200) (AMNH). ***San Juan Co.***: Brushy Basin Rim Road, NW of Blanding, County road # 227 0.5 E mp 116, T37S R12E, 37.7419°N 109.55267°W, 1737 m, 12 Jun 1982, M.D. Schwartz, 1♂ (AMNH_PBI 00101188), 1♀ (AMNH_PBI 00101202) (AMNH).

Hadronemidea Reuter

Type species: *Hadronemidea esau* Reuter, 1908 (by monotypy).

Hadronemidea Reuter, 1908: 172 [n. gen.]; Carvalho, 1958: 69 [catalog]; Schuh, 1995: 116 [catalog].

DIAGNOSIS: Recognized by the small, almost circular eyes, not reaching the anterior margin of the pronotum (figs. 3, 37A, 38A); the middle tibiae curved inward in males (figs. 37F, 38B); the first tarsal segment of the forelegs in males expanded laterally (fig. 38C); the vestiture composed of simple, erect, bristlelike setae (fig. 37D); the very long antennae (fig. 3); the absence of metathoracic scent-gland evaporatory area and peritreme (fig. 37B); the phallobase heavily sclerotized; the vesica with two spicules, right one short, left one long with two apicoventral ramifications (fig. 39); and the sclerotized part of the ductus seminis long, nearly reaching the apex of the right spicule (fig. 39).

Hadronemidea is unique among the genera of the *Hadronema* group by the small eyes removed from the anterior margin of the pronotum. *Hadronemidea* is most similar to *Hadronema* due to the dark coloration, the expanded first tarsal segment of the forelegs on males, and the bristlelike setae on dorsum, but it is easily distinguished from *Hadronema* by the apically constricted setae on the ventral part of the first tarsal segment of forelegs of males (fig. 38C), the right spicule of the vesica lateral to the left one (fig. 39), the longer sclerotized part of the ductus seminis (fig. 39), and the membranous anterior wall of females without any sclerotized areas (fig. 40).

REDESCRIPTION: *Male*: Large, elongate species, total length 4.95–5.56. COLORATION: Black with orange-red and white markings (fig. 3). HEAD: Black; clypeus basally with irregular shiny spots, sometimes inconspicuous; mandibular and maxillary plates black or brown, maxillary plates sometimes shiny; labrum dull or shiny; labium shiny black, first segment dull at middle; antennae black. THORAX: Collar black; anterior lobe of pronotum black, posterior lobe of pronotum orange-red, sometimes orange-red markings extending into lateral portions of anterior lobe and posterior lobe suffused anteriorly with black; scutellum black; proepisternum black; proepimeron orange-red, anteriorly black; meso- and metapleuron black; mesothoracic spiracle jet-black. *Hemelytra*: Clavus black; corium black, embolium white; cuneus black, external margin white; membrane dark brown, veins black. *Legs*: Black. ABDOMEN: Black, posterior margin of sternites weakly whitish. GENITALIA: Genital capsule black; parameres dark brown; proctiger pale, apically brown. SURFACE AND VESTITURE: Surface dull, beset with numerous small microtrichia; dark erect simple bristlelike setae on head, legs, and hemelytra (figs. 37A, D–F, 38A, B). STRUCTURE: HEAD (fig. 37A): Transverse, almost twice as wide as long, gently declivent, ovate in lateral view; clypeus gently protruding in dorsal view, vertical; frons convex; vertex from almost flat to weakly convex; frons and vertex beset with sparse long setae; transverse carina elevated but not strongly impressed, bearing bristlelike setae, more densely set next to eyes on an small weakly elevated area; mandibular and maxillary plates occupying about half the height of the head, apices rounded; gena with an oblique longitudinal area covered with long bristlelike setae extending from behind eyes down to buccula; gula long, as long as the buccula; eyes small, rounded in dorsal view, weakly ovate in lateral view, not reaching the anterior margin of pronotum; labrum almost as long as first labial segment or shorter, acute or acute at apex, nearly glabrous or densely covered by long simple setae; labium surpassing mesocoxa, segment I with long simple setae or nearly glabrous, II with dense long setae, or with sparse short setae, III–IV glabrous; antennae long, nearly as long as cuneus-clypeal length (fig. 3), segment I weakly greater in diameter than II, II and III of approximately equal diameter, IV with the lesser diameter, segment II nearly three times as long as I, III equal in length to II, IV the shortest, III with or without a fringe of long hairs on apical third in males (fig. 38D). THORAX: Collar short; pronotum trapezoidal in dorsal view, inclined, anterior angles rounded, posterior angles broadly rounded, lateral margins convex, sometimes almost straight, carinate or not (figs. 37A, 38A), surface weakly rugose, small or prominent transverse protuberance anterior to posterior margin, transverse protuberance deflexed

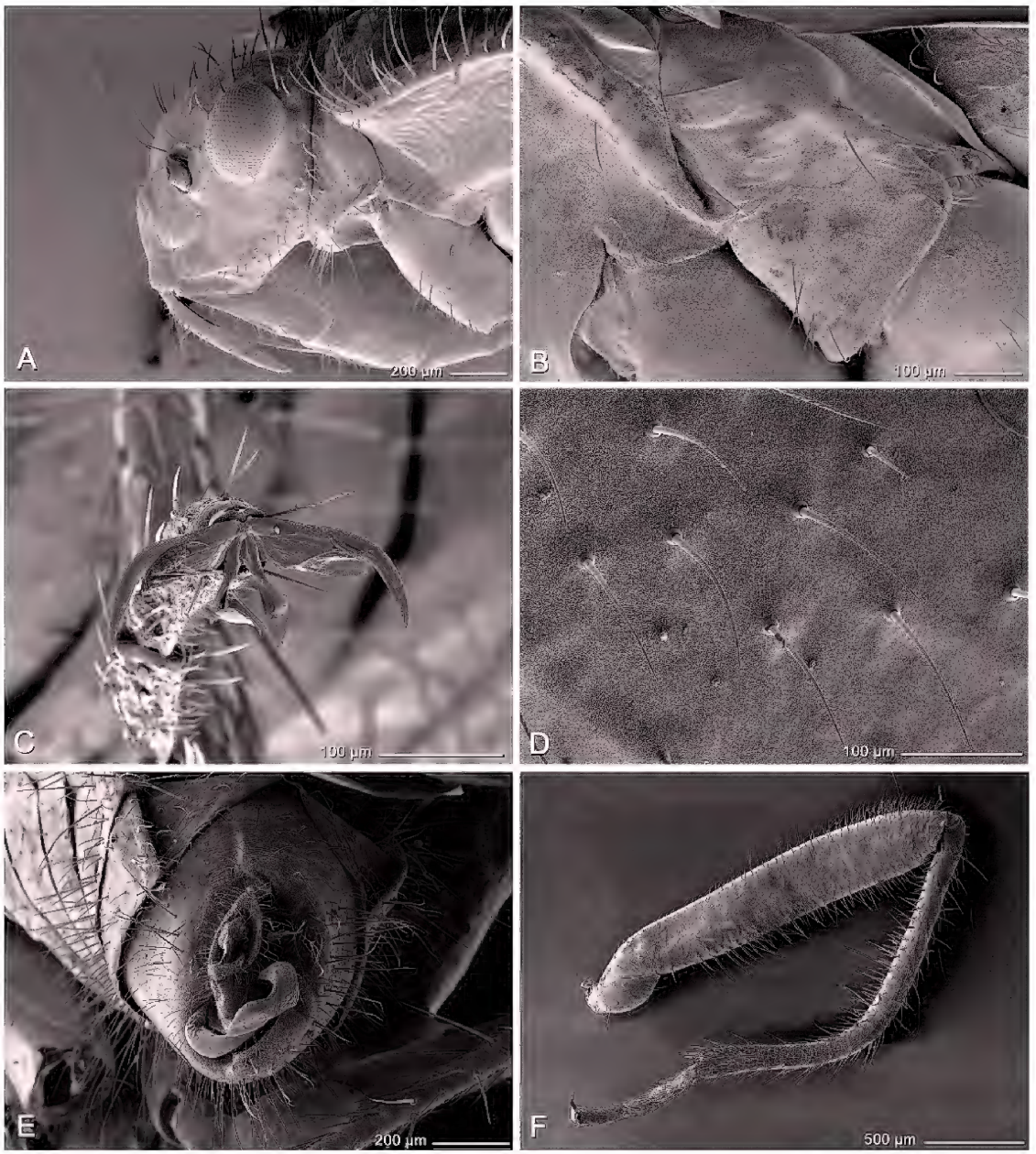

Fig. 37. *Hadronemidea esau*. **A**. Head and pronotum, lateral view. **B**. Mesepimeron and metepisternum. **C**. Pretarsus. **D**. Vestiture on hemelytron. **E**. Genital capsule, posterior view. **F**. Middle leg, male.

toward posterior margin; calli almost flat, not sharply differentiated from adjacent areas; mesoscutum covered by posterior margin of pronotum; scutellum triangular, nearly equilateral, disc weakly convex; proepisternum with numerous long bristlelike setae; proepimeron and remaining pleural sclerites nearly glabrous with only sparse simple setae; metepisternum covered with small microtrichia; metathoracic scent-gland evaporatory area absent (fig. 37B), only with a few ventral scattered units present; peri-

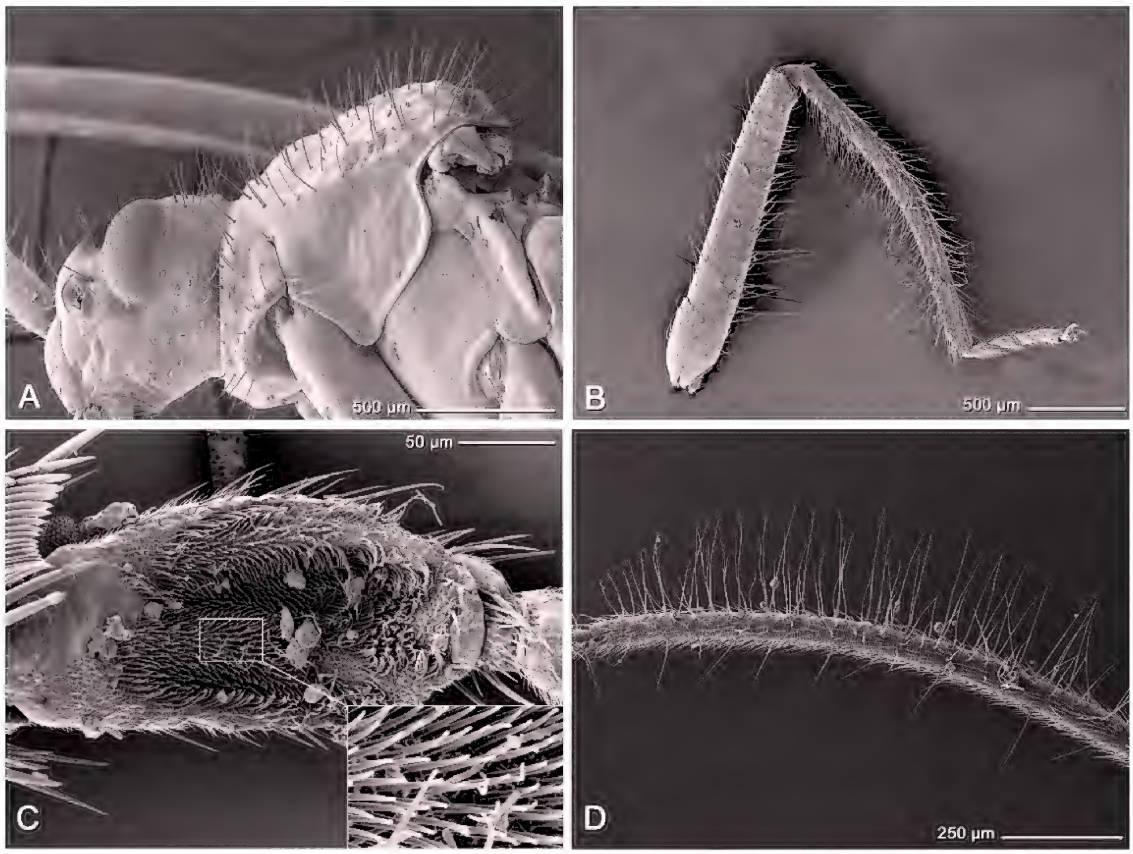

Fig. 38. *Hadronemidea echinata*. **A**. Head and pronotum, lateral view. **B**. Middle leg, male. **C**. Ventral surface of first tarsal segment of anterior leg, with inset of detailed structure of tenent setae, male. **D**. Apical third of third antennal segment, male.

treme absent; prosternum with long bristlelike setae on anterior margin (fig. 37A). *Hemelytra*: Long, surpassing apex of abdomen, parallel; clavus elevated with respect to corium and deflexed along claval suture; corium weakly deflexed laterally from medial fracture; cuneus weakly deflexed laterally, as wide as long; membrane about half as long as hemelytron. *Legs*: Coxae elongate with sparse bristlelike setae; trochanters oval with a few short setae; profemur and mesofemur subequal in length, metafemur longer, all straight and weakly compressed anteroposteriorly; profemur with short bristlelike setae; mesofemur with bristlelike setae on ventral surface, shorter than or as long as femur width, longest around the middle; metafemur with sparse short setae; pro- and mesotibia of approximate equal width and length, metatibia thinner and longer; protibia cylindrical, straight, barely expanded apically; mesotibia strongly or gently curved, weakly excavated anteriorly distally, with numerous long bristlelike setae, more abundant on ventral surface, from dense to very dense (figs. 37F, 38B); metatibia with bristlelike setae longer than width of tibia; protarsus with first segment expanded, covering apically the insertion of the second, ventral surface with long delicate tenent setae, apically constricted, not greatly expanded (fig. 38C), segments I and III subequal in length, II the shortest; mesotarsal segment I shorter than III, II the shortest; metatarsal segments I and II subequal in length, III the longest; pretarsus as in figure 37C. ABDOMEN: Segments II–VIII beset with long bristlelike setae. GENITALIA: Genital capsule subtriangular (figs. 37E, 39), aperture small or medium-sized, reclined, weakly turned to the left (figs. 37E, 39);

anterior margin of aperture well sclerotized or not (fig. 39); ventral right portion of genital capsule weakly caudad projected as a round blunt process (fig. 39); proctiger reaching apex of genital capsule (fig. 37E); cuplike sclerite barely reaching apex of genital capsule, U-shaped, right portion more dorsally and posteriorly produced than left one, bases wide or narrow, projected cephalad of supragenital bridge or barely so (fig. 39); supragenital bridge located above paramere insertions, heavily sclerotized (fig. 39); right paramere inserted barely above left relative to a horizontal plane (figs. 37E, 39); left paramere weakly or strongly curved, in latter case almost sickle-shaped, apicoventral process blunt or acute (fig. 39); right paramere hatchet-shaped in medial view, body long, small flat acuminate process on dorsal angle directed medially, forming a concavity, paramere flattened and expanded distally, with numerous small tubercles, from rounded to more produced cephalad (fig. 39); phallotheca nearly cylindrical, without protuberances (fig. 39), dorsal and ventrodistal surfaces well sclerotized, weakly so on ventroproximal surface, opening directed to the left, strongly reclined, nearly oval-shaped; vesica with two well-sclerotized spicules, located next to each other, with no sclerotized connection between them (fig. 39); left spicule long, thin at base, enlarged distally, truncate and tuberculate apically, two preapical cephalad projections (rami) of equal or different lengths, enlarged or not, denticulate or not (fig. 39); right spicule short, about half as long as left, flattened laterally, enlarged basally, curved upward distally, apically flat or nearly cylindrical, expanded or not, variously denticulate (fig. 39); sclerotized part of ductus seminis long, barely longer than right spicule, situated at base of spicules (fig. 39).

Female: Similar to male, but larger and broader, total length 5.21–6.53. COLORATION: As in male (fig. 3). SURFACE AND VESTITURE: As in male. STRUCTURE: THORAX: *Legs*: Pro- and mesotibia cylindrical, of equal width, straight. GENITALIA: Subgenital plate subrectangular, apically truncate or rounded (fig. 40), reaching or barely so to middle of sternite VIII; base of ovipositor located at longitudinal midpoint of abdomen; inner margin of gonapophysis VIII symmetrical (fig. 40); interramal sclerites well sclerotized oblong (fig. 40); dorsal lobes of interramal sclerites long, medial margin almost straight, lateral margin gently curved or nearly straight on distal half, covered with numerous microtrichia, apex acute (fig. 40); sigmoid process and dorsal margin of interramal sclerites up to base of dorsal lobes covered with microtrichia (fig. 40); medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized modified structures; sclerotized rings oblong, posterior edge produced or not, lateral margin recurved as a flaplike sclerite (fig. 40); accessory sclerite on anterolateral margin medium-sized, apically acute or enlarged (fig. 40); internal surface of dorsal labiate plate covered with microtrichia; anterior wall membranous (fig. 40).

DISTRIBUTION: In the United states from west Texas and southern New Mexico south to central Mexico across the Transverse Volcanic Axis (fig. 41).

HOST ASSOCIATIONS: Although most of the examined specimens of *Hadronemidea* lack detailed host-plant data, it is evident that most of the specimens have been associated with either Asteraceae or Fabaceae. This is similar to the associations found in *Hadronema*.

DISCUSSION: Gruetzmacher and Schaffner (1977) described *H. echinata* and included this species under a redefined *Hadronema*. Nevertheless, this species fits better with the new concept of *Hadronemidea*, rendering *Hadronema* as a monophyletic group.

The reduced evaporatory area is not exclusive of *Hadronemidea*. *Aoplonemella* and some species of *Daleapidea* also lack a distinctive evaporatory area. *Hadronema* has a reduced but still recognizable evaporatory area. It seems that species in the *Hadronema* group have a tendency toward this reduction. Other groups of Miridae have a similar reduction of the evaporatory area, for instance, *Prepops* Reuter and other members of the Resthenini (Mirinae) (Schwartz, 1987), some Bryocorinae, and even some genera of Pentatomidae, as well as most Rhopalidae (Carayon, 1971).

Key to the Species of *Hadronemidea*

1. Lateral margins of pronotum strongly carinate (figs. 3, 37A); males with mesotibia strongly recurved inward (fig. 37F); males with apical third of antennal segment III without long setae, setae of same length over entire segment; apex of left spicule of vesica expanded as a rounded lobe, denticulate (fig. 39, arrow) . . . . . *H. esau*
— Lateral margins of pronotum not strongly carinate, rounded (figs. 3, 38A); males with mesotibia weakly curved inward (fig. 38B); males with apical third of antennal segment III with long setae (fig. 38D); apex of left spicule of vesica acute, with few denticles (fig. 39, arrow) . . . . . *H. echinata*

Hadronemidea echinata (Gruetzmacher and Schaffner), **new combination**
Figures 3, 38–41

Hadronema echinata Gruetzmacher and Schaffner, 1977: 53 [n. sp.].
Hadronema (Aoplonema) echinatum: Henry and Wheeler, 1988: 410 [catalog].
Aoplonema echinatum: Kerzhner and Schuh, 1995: 4 [new placement]; Schuh, 1995: 81 [catalog].

DIAGNOSIS: Recognized by the nearly straight, rounded, lateral margins of the pronotum (fig. 38A); the prominent transverse posterior protuberance near the posterior margin of pronotum (fig. 38A); the weakly curved mesotibia in males, covered with dense bristlelike setae on ventral surface (fig. 38B); the short and not denticulate rami of left spicule (fig. 39, arrow); and the acute, barely tuberculate apex of the right spicule (fig. 39, arrow).

Hadronemidea echinata may be distinguished from *H. esau* by the key provided and by the diagnostic characters mentioned above.

REDESCRIPTION: *Male:* Large, robust, total length 4.95–5.52. COLORATION (fig. 3): HEAD: Mandibular and maxillary plates usually brown; maxillary plates dull, not shiny; labrum shiny. THORAX: Anterior lobe of pronotum black, posterior lobe of pronotum orange-red, with small, median, irregular longitudinal black line on anterior half, sometimes anterior portion of posterior lobe with a diffuse black rounded marking. STRUCTURE: HEAD: Labrum shorter than first labial segment, nearly glabrous, narrow and acute apically; antennal segment III with a fringe of long setae on apical third (fig. 38D). THORAX: Pronotum with lateral margins nearly straight, rounded; transverse posterior protuberance of pronotum usually prominent (fig. 38A), in some specimens smaller. *Legs:* Mesofemur with setae longer than femur width (fig. 38B); mesotibia gently curved inward, setae dense (fig. 38B). GENITALIA: Genital capsule subtriangular, almost globose, aperture small, anterior margin well sclerotized (fig. 39); left paramere gently curved distally, apicoventral process acute (fig. 39, arrows); right paramere broadly rounded apically (fig. 39, arrow); rami of left spicule about the same length, thin, not denticulate (fig. 39, arrow); right spicule apically cylindrical, barely denticulate, almost directed caudad (fig. 39, arrow).

Female: Similar to male in structure and coloration, but larger, total length 5.28–6.53. STRUCTURE: GENITALIA (fig. 40): Subgenital plate apically truncated; dorsal lobes of interramal sclerites with distal half of external margin almost straight; sclerotized rings produced posteriad as a sclerotized prolongation; accessory sclerite on anterolateral margin enlarged.

DISTRIBUTION: West Texas and adjacent New Mexico (United States) to central Mexico, mostly in the Sierra Madre Oriental (fig. 41).

HOSTS: Most of the host records are on *Gutierrezia* sp. (Asteraceae) with a few on *Dalea frutescens* (Fabaceae).

DISCUSSION: Gruetzmacher and Schaffner (1977) described *H. echinata* and expanded the generic concept of *Hadronema* in order to accommodate their new species. Kerzhner and Schuh (1995) later transferred *H. echinata* to *Aoplonema* based on male genitalia characters and "other structural features". Nevertheless, the vesica in *Aoplonema* consists of a deeply cleft single spiculum whereas in *H. echinata* there are two separate sclerites. The only argument for considering this species within *Aoplonema* is the absence of a basal front femora tubercle. As shown above, this character is shared only by species of *Hadronema*, and it is not present in any of the other species of the group. *Hadronemidea echinata* does not fit the concept of either *Hadronema* or *Aoplonema*.

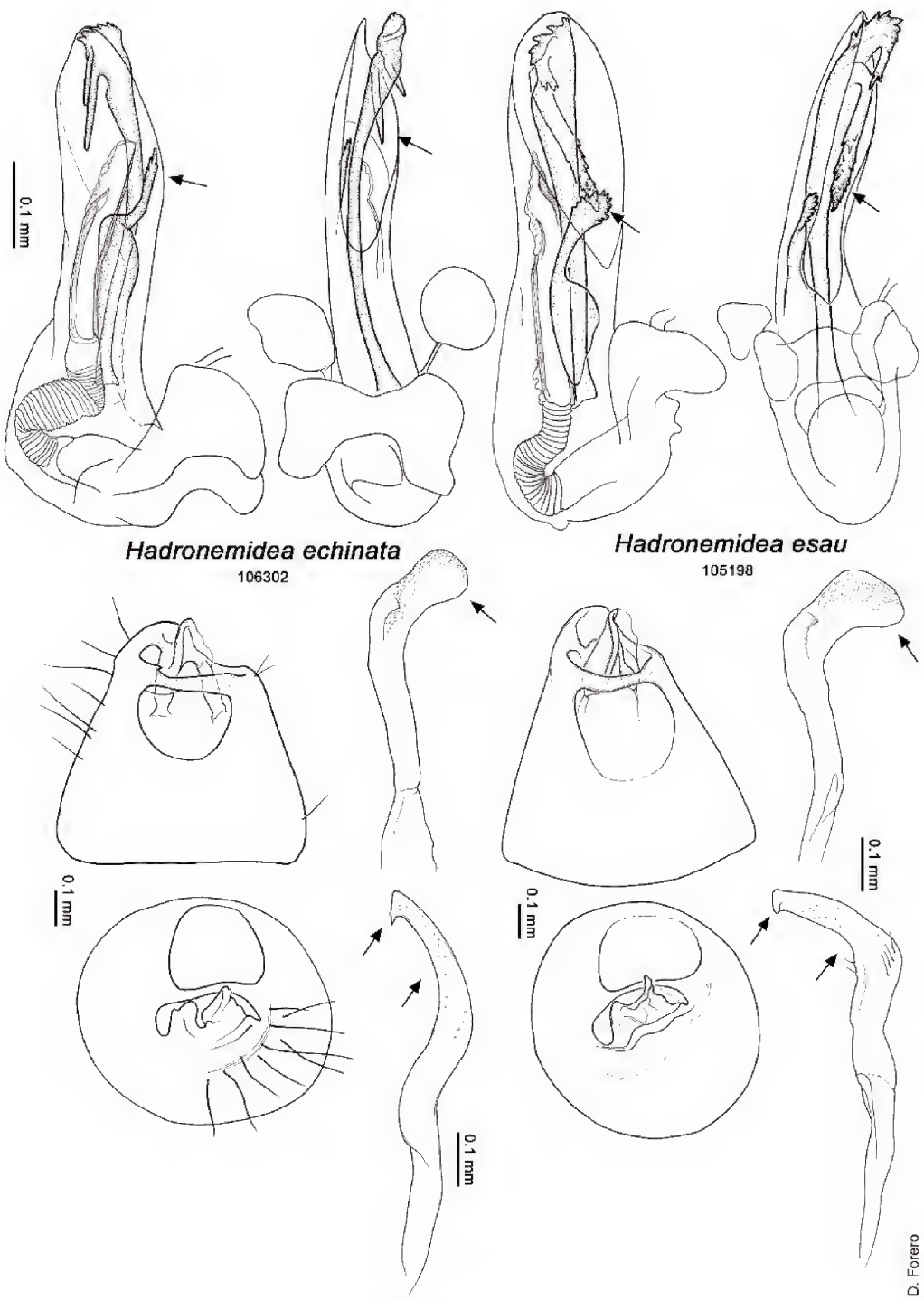

Fig. 39. *Hadronemidea echinata* and *H. esau*. Male genitalia: vesica, lateral right and dorsal views; genital capsule, dorsal and posterior views; right and left parameres, dorsomedial and dorsal views respectively. Genital capsule of *H. esau* not showing chaetotaxia. Arrows indicate species characters (see text for details).

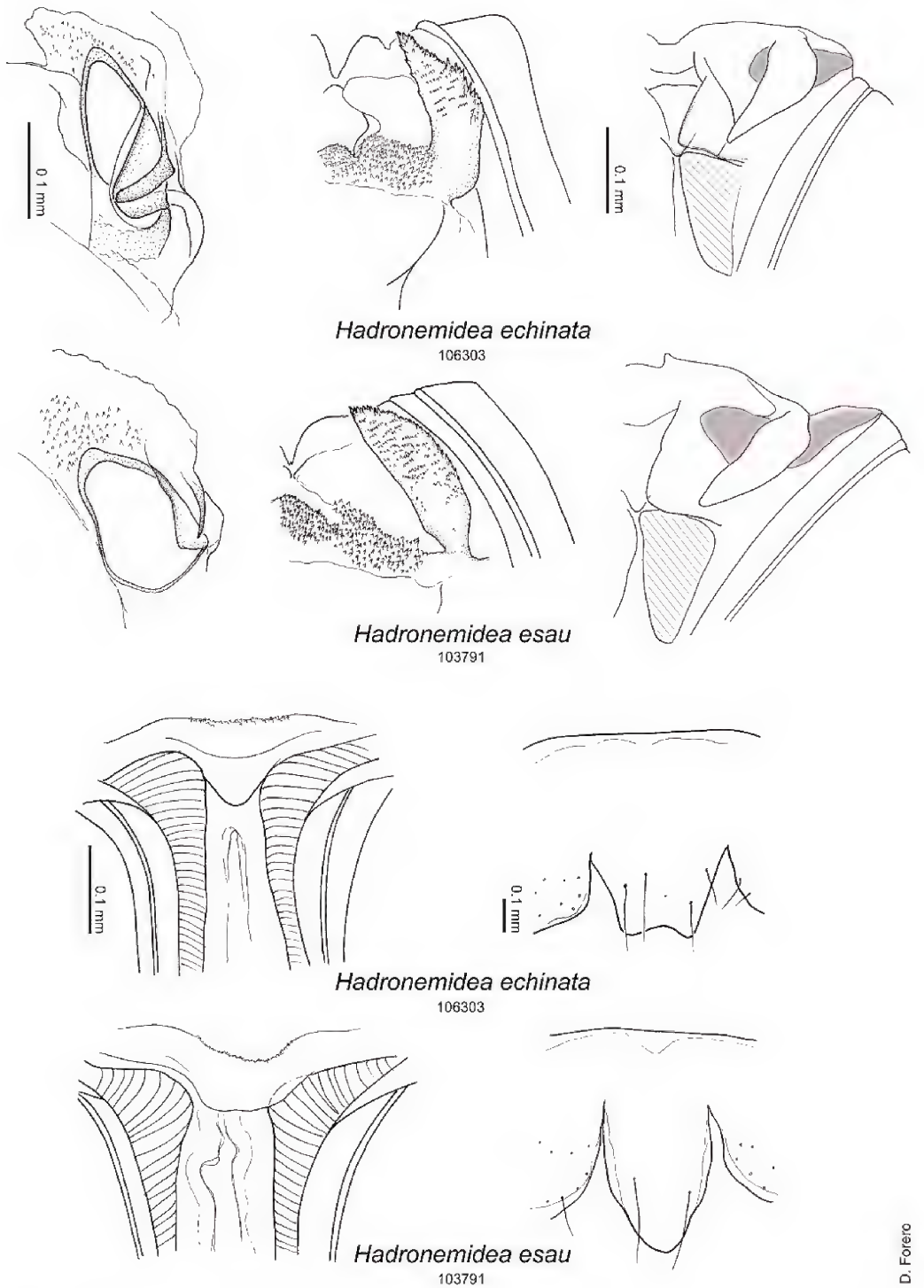

Fig. 40. *Hadronemidea echinata* and *H. esau*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic; anterior wall, posterior view; subgenital plate, ventral view.

Some minor structural and color variation may occur in some Mexican specimens (AMNH_PBI 00103801–AMNH_PBI 00103803). All of these have the pronotum with a less pronounced transverse protuberance anterior to the posterior margin, whereas in other specimens of *H. echinata* from the USA this structure is more prominent. The posterior margin of the dark area of the pronotum is gently curved, covering part of the posterior lobe, while in the USA specimens this margin is straight. Nevertheless, male and female genitalia, and other external morphological structures, bear no characters that allow for distinguishing the Mexican specimens from those in the USA.

HOLOTYPE MALE: **USA: Texas: *Jeff Davis Co.:*** 15 mi. W of Fort Davis, 23 Aug 1969, [30.7754°N 104.15965°W], Board and Hafernik, Holotype *Hadronema echinata* Gruetzmacher and Schaffner, 1♂ (AMH_PBI 00160640) (USNM).

PARATYPES: **USA: Texas: *Brewster Co.:*** South Rim Trail, Chisos Mountains, Big Bend National Park, 29.22936°N 103.2954°W, 2118 m, 16 Aug 1968, J.E. Hafernik, 1♀ (AMNH_PBI 00105878) (TAMU). Window trail, Big Bend National Park, 29.28054°N 103.31262°W, 15 Aug 1968, M.L. Allender, 1♀ (AMNH_PBI 00105879) (TAMU). ***Culberson Co.:*** 20 mi N of Van Horn, 31.33°N 104.83°W, 19 Aug 1969, Board and Hafernik, 1♂ (AMNH_PBI 00105865) (TAMU). ***Jeff Davis Co.:*** 15 mi W of Fort Davis, 30.7754°N 104.15965°W, 23 Aug 1969, Board and Hafernik, 2♂ (AMNH_PBI 00065287, AMNH_PBI 00065288) (JTP); 21♂ (AMNH_PBI 00105845–AMNH_PBI 00105864, AMNH_PBI 00105923), 4♀ (AMNH_PBI 00105874–AMNH_PBI 00105877) (TAMU); 2♂ (AMNH_PBI 00106817, AMNH_PBI 00106818), 2♀ (AMNH_PBI 00106819, AMNH_PBI 00106820) (USNM). 39.7 km NW of Fort Davis, 30.58806°N 103.89417°W, 10 Sep 1988, R. Anderson, *Gutierrezia* sp. (Asteraceae), 1♂ (AMNH_PBI 00105924) (TAMU).

OTHER SPECIMENS EXAMINED: **MEXICO: Durango:** 4 mi SW of Yerbanis, 25 Aug 1981, J. Chemsak and A. and M. Michelbacher, 1♀ (AMNH_PBI 00079950) (UCB). 8 mi SE of Nombre de Dios, 23.76778°N 104.14346°W, 24 Aug 1981, J. Chemsak and A. and M. Michelbacher, 3♂ (AMNH_PBI 00079945–AMNH_PBI 00079947), 1♀ (AMNH_PBI 00079949) (UCB). **Nuevo Leon:** 40 mi S of San Roberto, 24.13552°N 100.28333°W, 22 Sep 1976, J.A. Chemsak, J. Powell, A. and M. Michelbacher, 1♂ (AMNH_PBI 00079948) (UCB). 5 mi E of Galeana junction, 24.83331°N 99.98662°W, 16 Sep 1976–17 Sep 1976, J.A. Chemsak, J. Powell, A. and M. Michelbacher, 1♀ (AMNH_PBI 00079951) (UCB). **San Luis Potosi:** 3 mi W of Cedral, 23.79999°N 100.78097°W, 1829 m, 21 Sep 1976, J.A. Chemsak, J. Powell, A. and M. Michelbacher, 1♂ (AMNH_PBI 00079824) (USNM). Huizache, 22.91667°N 100.41666°W, 17 Nov 1977, H. Brailovsky, 2♂ (AMNH_PBI 00106822, AMNH_PBI 00106823), 5♀ (AMNH_PBI 00106825–AMNH_PBI 00106829) (USNM); 17 Oct 1977, H. Brailovsky, 5♀ (AMNH_PBI 00106830–AMNH_PBI 00106834) (USNM). Villa Hidalgo, 22.45°N 100.7°W, 07 Sep 1969, L.A. Kelton, 1♂ (AMNH_PBI 00103801), 2♀ (AMNH_PBI 00103802, AMNH_PBI 00103803) (CNC). **Tamaulipas:** Ciudad Victoria, 23.73333°N 99.13333°W, 17 Nov 1977, H. Brailovsky, 1♀ (AMNH_PBI 00106824) (USNM). **USA: New Mexico: *Otero Co.:*** 2 mi E of Mayhill, taken along Rio Penasco, 32.88944°N 105.44306°W, 22 Aug 1982, B.J. Hanselmann, 1♂ (AMNH_PBI 00105866) (TAMU). 6 mi SW of Weed, 32.79521°N 105.59866°W, 2289 m, 15 Sep 1973, N. Jorgensen, 2♂ (AMNH_PBI 00103799, AMNH_PBI 00103800) (CNC). **Texas: *Brewster Co.:*** Big Bend National Park, 29.56527°N 103.26055°W, 31 Aug 1986–2 Sep 1986, East, Haack, Kovarik, 1♂ (AMNH_PBI 00106035) (TAMU). Big Bend National Park, Colima trail, 29.26327°N 103.29494°W, 2179 m, 07 Sep 1988, R. Anderson, 1♀ (AMNH_PBI 00105891) (TAMU). Big Bend National Park, Lost Mine Trail, 29.2704°N 103.269°W, 1890 m, 09 Sep 1988, R. Anderson, *Gutierrezia* sp. (Asteraceae), 2♀ (AMNH_PBI 00105892, AMNH_PBI 00106303) (TAMU). Marathon, 30.205°N 103.24417°W, 02 Sep 1936, E.D. Ball, 1♀ (AMNH_PBI 00106821) (USNM). ***Jeff Davis Co.:*** 39.7 km NW of Fort Davis, 30.58806°N 103.89417°W, 10 Sep 1988, R. Anderson, *Gutierrezia* sp. (Asteraceae), 8♂ (AMNH_PBI 00105867–AMNH_PBI 00105873, AMNH_PBI 00106302), 10♀ (AMNH_PBI 00105880–AMNH_PBI 00105889) (TAMU). Davis Mountains State Park, 30.59583°N 103.92972°W, 06 Oct 1988, M.D. Schwartz,

Dalea frutescens A. Gray (Fabaceae), det. A. Tiehm (NYBG), 5♀ (AMNH_PBI 00100855–AMNH_PBI 00100859) (AMNH). McDonald Observatory, 30.67153°N 104.0215°W, 2055 m, 13 Aug 1992, J.C. Schaffner, 1♀ (AMNH_PBI 00105890) (TAMU).

Hadronemidea esau Reuter
Figures 3, 37, 39–41

Hadronemidea esau Reuter, 1908: 173 [n. sp.]; Carvalho, 1958: 69 [catalog]; Schuh, 1995: 116 [catalog].

DIAGNOSIS: Recognized by the weakly arcuate and strongly marginate lateral margins of the pronotum (figs. 3, 37A); the transverse posterior protuberance near posterior margin of pronotum not strongly elevated; the strongly curved mesotibia in males, covered with scattered bristlelike setae (fig. 37F); the expanded and extensively denticulate rami of the left spicule (fig. 39, arrow); and the roundly expanded and denticulate apex of the right spicule (fig. 39, arrow).

Hadronemidea esau may be distinguished from *H. echinata* by the key provided and by the diagnostic characters mentioned above.

REDESCRIPTION: *Male:* Large, robust, total length 5.35–5.56. COLORATION (fig. 3): HEAD: Mandibular plates dark brown, sometimes black; maxillary plates black, anteriorly shiny; labrum dull. THORAX: Anterior lobe of pronotum black, posterior lobe, including lateral carina, orange-red, anterior margin with a U-shaped black macula. STRUCTURE: HEAD: Labrum long, as long as first labial segment, densely setose, broad and weakly rounded apically (fig. 37A); antennal segment III with short sparse setae on apical third. THORAX: Pronotum with lateral margins strongly carinate (fig. 37A); transverse posterior protuberance of pronotum low. *Legs:* Mesofemur with setae shorter than femur width (fig. 37F); mesotibia strongly curved inward, setae short, sparse (fig. 37F). GENITALIA: Genital capsule subtriangular, not rounded, aperture medium-sized, anterior margin not well sclerotized (figs. 37E, 39); left paramere strongly curved, sickle-shaped, ventral process blunt (fig. 39, arrows); right paramere weakly rounded apically, almost truncate, ventral margin produced cephalad (fig. 39, arrow); rami of left spicule unequal in length, apical spicule shorter than preapical, both enlarged distally, strongly denticulate (fig. 39, arrow); right spicule apically flattened and expanded, margin denticulate, directed upward (fig. 39, arrow).

Female: Similar to male in structure and coloration, but larger, total length 5.21–6.34. STRUCTURE: GENITALIA (fig. 40): Subgenital plate apically rounded; dorsal lobes of interramal sclerites with distal half lateral margin gently curved inward; sclerotized rings ovate, not produced posteriorly; accessory sclerite on anterolateral margin acute.

DISTRIBUTION: Known from central Mexico and the Sierra Madre Oriental (fig. 41).

HOSTS: Available host-plant data for *H. esau* indicate that the taxon is restricted to legumes. Half the records are on *Dalea* sp. and half on unidentified species of Fabaceae.

DISCUSSION: Reuter described *H. esau* based on two females from Mexico. Only one specimen bearing an identification label in Reuter's handwriting from the Helsinki collection was found. Reuter specimens were from two localities, "Takubaya" and "Chapultepek". The examined specimen matches Reuter (1908) description, although the label only states "Mexico, Bilimek", without a more precise locality, and Bilimek being the collector (cf. Reuter, 1908). It is probable that exact localities were communicated to Reuter by Bilimek himself. Because this specimen is the only one bearing a Reuter determination label that matches his description, except for the specific locality data, I am designating it as the lectotype.

Because Reuter's description was based on females, the middle leg character of the male was unavailable. The description of the laterally produced pronotum, with a large median black macula, and the length of the antennae are particularly important characters to identify this taxon.

LECTOTYPE FEMALE (here designated): **MEXICO:** Unknown locality, 1871, Bilimek, "*Hadronemidea esau* n. g. et sp." O.M. Reuter det., Mus. Zool. H:Fors Spec. Typ. 9919, Lectotype *Hadronemidea esau* Reuter, 1908 desig. by D. Forero (red label), 1♀ (AMNH_PBI 00099704) (MZH).

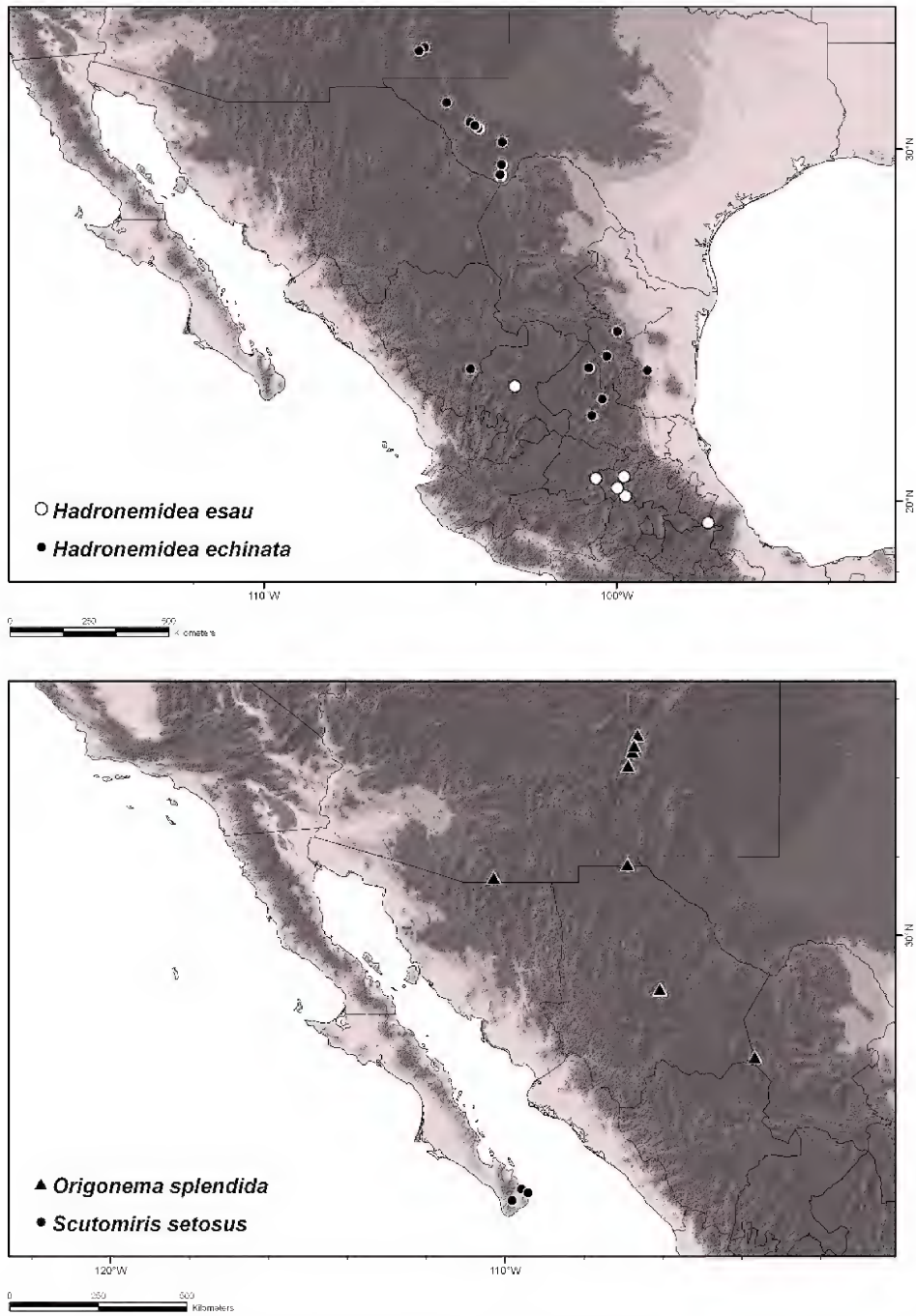

Fig. 41. Distribution maps for *Hadronemidea esau*, *H. echinata*, *Origonema splendida*, and *Scutomiris setosus*.

OTHER SPECIMENS EXAMINED: **MEXICO: Guanajuato:** Ojo de Agua, 20.65°N 100.58333°W, 06 Sep 1969, L.A. Kelton, 8♂ (AMNH_PBI 00103772, AMNH_PBI 00103773, AMNH_PBI 00103777–AMNH_PBI 00103780, AMNH_PBI 00105197, AMNH_PBI 00105198), 12♀ (AMNH_PBI 00103786–AMNH_PBI 00103788, AMNH_PBI 00103790–AMNH_PBI

00103798) (CNC). **Mexico:** Encinillas [sic Encinello], 20.15°N 99.75°W, 2453 m, 02 Sep 1969, L.A. Kelton, (Fabaceae), 2♂ (AMNH_PBI 00103767, AMNH_PBI 00103768), 5♀ (AMNH_PBI 00103781–AMNH_PBI 00103785) (CNC). **Puebla:** 3 km SW of Zalayeta on Route 140, 13 Sep 1989, E. Barrera, T.J. Henry, I.M. Kerzhner, 1♂ (AMNH_PBI 00106836), 2♀ (AMNH_PBI 00106839, AMNH_PBI 00106840) (USNM). **Queretaro:** 1 mi E of Cadereyta, 2073 m, 15 Aug 1974, L. and C.W. O'Brien and G.B. Marshall, 1♂ (AMNH_PBI 00106835), 2♀ (AMNH_PBI 00106837, AMNH_PBI 00106838) (USNM). San Juan del Rio, 20.38333°N 99.98333°W, 03 Sep 1969, L.A. Kelton, *Dalea* sp. (Fabaceae), 6♂ (AMNH_PBI 00103769–AMNH_PBI 00103771, AMNH_PBI 00103774–AMNH_PBI 00103776), 1♀ (AMNH_PBI 00103789) (CNC). **Zacatecas:** 8 mi NW of Fresnillo, 23.26551°N 102.88942°W, 24 Aug 1981, J. Chemsak and A. and M. Michelbacher, 1♀ (AMNH_PBI 00079952) (UCB).

Origonema, gen. nov.

Type species: *Hadronema splendida* Gibson, 1918.

DIAGNOSIS: Recognized by the dark bristlelike setae on dorsum (figs. 3, 42D); the gray dorsum with dark brown spots at the base of the bristlelike setae (fig. 3); the subtle subbasal expansion on the ventral surface of mesotibia of males (fig. 42F, arrow); the vesica with two lateral spicules, the left one with two subapical rami (fig. 43); the long, narrow, capitate dorsal lobes of the interramal sclerites in the females (fig. 44); and the weakly corrugated interramal sclerites (fig. 44).

Origonema is most similar to *Hadronema* due to the dark erect bristlelike setae on dorsum, and shape of head and thorax. *Origonema* is distinguished from it by the structure of the right paramere with an enlarged apex (fig. 43) and a medial flange projecting ventrad (fig. 43), the front femora of the males nearly cylindrical, without any tubercles on its ventral surface, and the first tarsal segment of the foreleg cylindrical. *Origonema* females can be distinguished from *Hadronema* by the narrower and longer dorsal lobes of the interramal sclerites with a capitate apex (fig. 44), and by the membranous anterior wall (fig. 44). *Origonema* females may be confused with *D. decorata* due to the overall hemelytral coloration, but can be distinguished from it by the orange femora (fig. 3), which are black in *D. decorata*. *Origonema* can be further separated from all the remaining genera of the *Hadronema* group by the structure of the male genitalia, the subbasal expansion on the ventral surface of the mesotibia in the males, and by the weakly sclerotized sigmoid process, corrugated interramal sclerites, and capitate dorsal lobes of the interramal sclerites in the females.

DESCRIPTION: *Male:* Medium-sized, total length 2.87–3.19. COLORATION: Gray dorsum with white, orange, and black markings (fig. 3). SURFACE AND VESTITURE: Surface dull, densely beset with microtrichia; dark erect bristlelike setae on dorsum (fig. 42D). STRUCTURE: HEAD (fig. 42A): Transverse, declivent, ovate in lateral view; clypeus not prominent, basally protruding, barely visible in dorsal view, with a medial longitudinal area of irregular shiny spots, and apically with sparse bristlelike setae; frons convex; vertex almost flat, weakly convex, vertex and frons with sparse bristlelike setae; transverse carina elevated, strongly impressed, with a row of bristlelike setae; mandibular and maxillary plates occupying about half the height of the head, apices weakly rounded, almost truncate; gena with a row of simple setae extending from behind eyes to middle of buccula; gula short; eyes oval in lateral view, weakly projecting laterally in dorsal view, adjacent to anterior margin of pronotum; buccula not produced laterally, with a few simple setae; labrum as long as buccula, apex acute; labium surpassing mesocoxa, almost reaching metacoxa, segments I–II with very short setae, other segments glabrous, segment I dull, II–IV shiny; antennal segment I weakly greater in diameter than II, III weakly lesser in diameter than II, III and IV subequal in diameter, segment II barely longer than III, about three times as long as I, I and IV subequal in length. THORAX: Collar narrow, flat; pronotum trapezoidal, almost bell-shaped, lateral margins sinuate, posterior margin straight, anterior angles broadly rounded, posterior angles rounded and

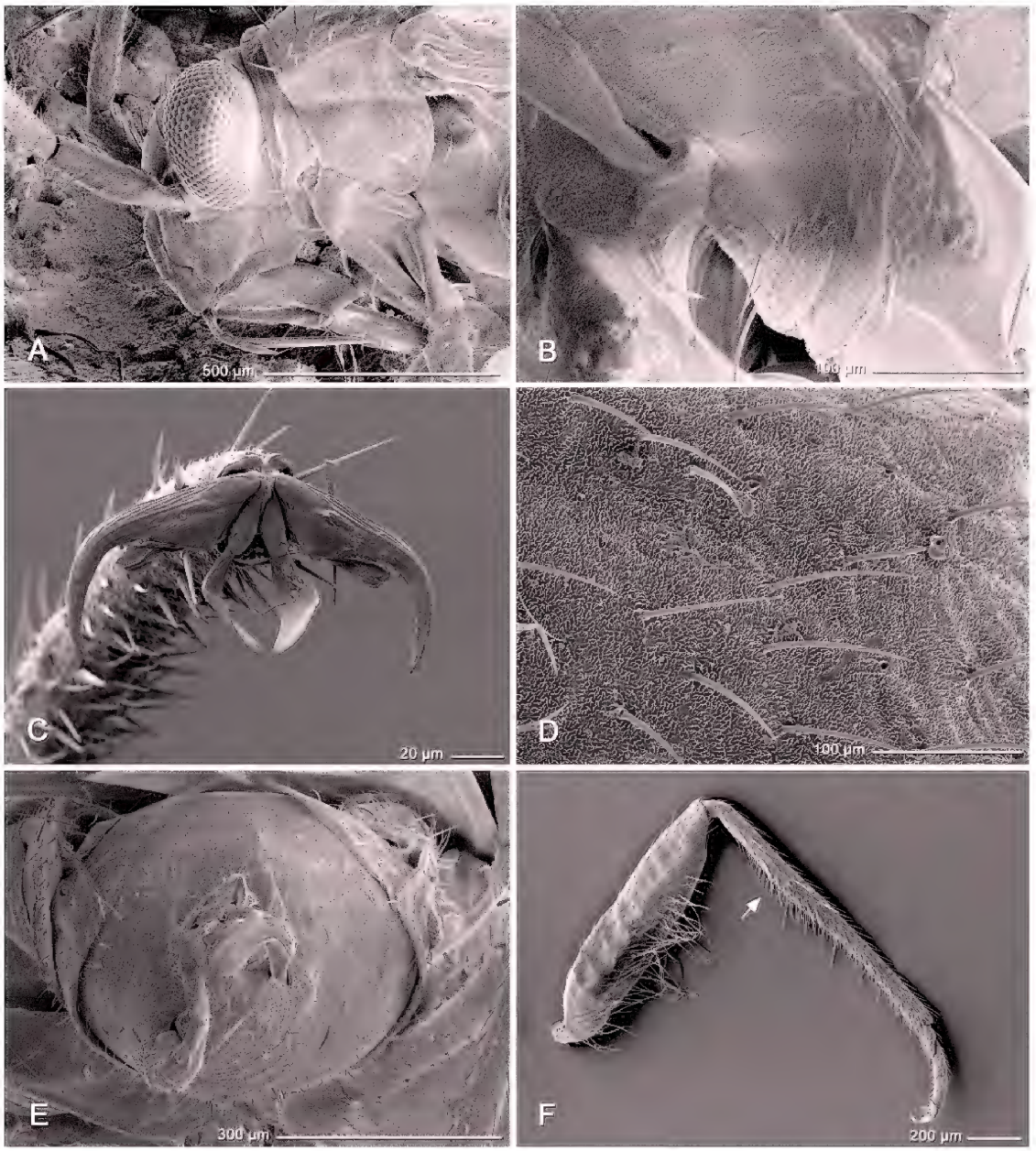

Fig. 42. *Origonema splendida*. **A**. Head, lateral view. **B**. Mesepimeron and metepisternum. **C**. Pretarsus. **D**. Vestiture on hemelytron. **E**. Genital capsule, posterior view. **F**. Middle leg, male; arrow indicates subbasal enlargement.

oblique, surface gently inclined, posterior lobe weakly rugose; mesoscutum usually covered by posterior margin of pronotum; scutellum nearly equilateral, apex rounded, disc flat, weakly rounded toward lateral margins; pleural area with sparse simple setae; metepisternum densely covered with macrotrichia; metathoracic scent-gland evaporatory area extremely reduced, composed of a few evaporatory units visible only in lateral view; peritreme greatly enlarged (fig. 42B). *Hemelytra:* Nearly parallel; clavus

weakly elevated with respect to corium; corium weakly deflexed laterally from medial fracture; cuneus weakly longer than wide, not deflected; membrane about half as long as hemelytron. *Legs:* Coxae elongate, procoxa with medium-sized length simple setae on anterior surface; trochanters ovoid, with sparse simple setae longer than trochanter width; pro- and mesofemur about the same length, metafemur barely longer; femora basally enlarged, gently narrowing distally, weakly compressed anteroposteriorly; profemur with bristlelike setae ventrally on proximal half; mesofemur with numerous delicate long simple setae on ventral surface; metafemur with short simple setae; tibiae straight; protibia weakly greater in diameter than mesotibia, subequal in length to mesotibia, protibia with dense short simple setae on distal half of ventral surface, also with a few long bristlelike setae; mesotibia with a subtle subbasal ventral expansion covered with dense short bristlelike setae, with a few longer bristlelike setae on remaining ventral surface (fig. 42F); metatibia uniformly covered with short simple setae and sparse longer bristlelike setae; tarsi cylindrical, first tarsomere subequal to second, third the longest; first tarsomere of pro- and mesotarsus densely covered with small simple setae; pretarsi as in figure 42C. ABDOMEN: Sternites covered with short and long simple setae. GENITALIA (fig. 43): Genital capsule subtriangular in dorsal view; aperture big, inclined, weakly turned to the left, anterior margin weakly sclerotized; right ventrolateral projection weakly produced, barely surpassing apex of cuplike sclerite, apex rounded; proctiger reaching posterior margin of genital capsule (fig. 42E); cuplike sclerite not reaching posterior margin of genital capsule, right portion more produced posteriorly and more elevated than left portion, bases barely surpassing supragenital bridge anteriorly; supragenital bridge narrow, located above insertions of parameres; insertion of right paramere above of left one relative to horizontal plane (fig. 42E); left paramere sickle-shaped, apicoventral process blunt; right paramere hatchet-shaped in medial view, body largely elongate, small dorsal medially directed process blunt, weakly denticulate, apex of paramere broadly rounded, weakly produced cephalad, paramere with an medioventral flange; phallotheca cylindrical, without protuberances on surface, not forming a completely sclerotized tube, only dorsal and ventrodistal portions well sclerotized, ventroproximal portion weakly so, opening large, almost reaching phallobase, reclined, oval, directed to the left; vesica composed of two separate sclerotized spicules, left and right; left spicule enlarged apically, apex rounded, with two preapical cephalad projections (rami) inserted next to each other, both rami expanded apically and denticulate, not reaching apex of right spicule; right spicule about half as long as left, strongly curving upward on apical half, apex flat, denticulate, weakly curved to the left over the base of the left spicule, and apically weakly denticulate; sclerotized part of ductus seminis long, about as long as right spicule, located at base of insertion of spicules.

Female: Similar to male but more ovoid, total length 3.19–3.48. COLORATION: Similar to male (fig. 3). SURFACE AND VESTITURE: As in male. STRUCTURE: THORAX: *Legs:* Coxae with short simple setae; tibiae with uniform short simple setae. GENITALIA (fig. 44): Subgenital plate triangular, longer than wide, apex roundly acute, reaching middle of sternite VIII; base of ovipositor located at longitudinal midpoint of abdomen; interramal sclerites oblong, well sclerotized, surface nearly rugulose; dorsal lobes of interramal sclerites long, narrow, with nearly parallel margins, capitate, apex nearly rounded with a few microtrichia; sigmoid process and dorsal margin of interramal sclerite covered with sparse microtrichia, sigmoid process weakly sclerotized; medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized or modified structures; sclerotized rings well sclerotized, long, subquadrangular, nearly parallel-sided, medial posterior projection greatly enlarged caudad, lateral margin broad, recurved, and well sclerotized; accessory sclerite narrow, acute; ventral labiate plate without any conspicuous modifications or folds; inner margins of first gonapophyses symmetrical; anterior wall simple, membranous.

DISTRIBUTION: From central New Mexico (USA) to northern Mexico (fig. 41).

HOST ASSOCIATIONS: Host-plant data for this taxon are scanty. Apparently *Origonema* is associated with Fabaceae, which agrees with observations on other members of the *Hadronema* group.

ETYMOLOGY: *Origonema* is formed from the Latin "origo", origin, and "nema", an arbitrary combination of letters from part of the name "*Hadronema*"; gender is feminine. The name alludes to the apparently simplified external morphology of the type species.

DISCUSSION: *Origonema splendida* was included by Gibson (1918) in *Hadronema*, and although it externally resembles that genus mainly due to its vestiture and head structure, it does not share any of the synapomorphies of *Hadronema* (see "Phylogenetic Analysis" below). Among the most relevant differences are the membranous simple anterior wall; the weakly corrugated interramal sclerites of the female (fig. 44); the nearly cylindrical profemur without ventral tubercles of males; cylindrical first tarsomere of the protarsus of males; and the right spicule of the vesica lateral respect to the left, with strongly curved apex (fig. 43).

Origonema splendida (Gibson),
new combination
Figures 3, 41–44

Hadronema splendida Gibson, 1918: 84 [n. sp.]; Knight 1928: 181 [key]; Carvalho, 1958: 69 [catalog]; Schuh 1995: 116 [catalog].

Hadronema splendidum: Steyskal, 1973: 207 [emendation].

Hadronema (Hadronema) splendidum: Henry and Wheeler, 1988: 411 [catalog].

DIAGNOSIS: See generic description.

REDESCRIPTION: *Male:* Total length 2.87–3.19. COLORATION (fig. 3): Gray with white, orange, and black markings. HEAD: Black; frons with medial area weakly pale orange; area adjacent to the eyes on vertex whitish, extending down to the antennal sockets, pale median spot in front of ocular carina; mandibular and maxillary plates orange, maxillary plates apically black, suture at base of plates connecting antennal socket to eye pigmented black; gena pale brown; gula black; eyes black; buccula pale on ventral margin; labrum dark brown; labium dark brown, shiny, segment I dull, weakly orange pale; antennae black. THORAX: Collar gray; pronotum gray with some darker areas; calli black, anterior area between calli and posterior to it greenish; mesoscutum black, medially suffused with orange; scutellum bright orange; proepisternum black; proepimeron anteriorly black, posteriorly gray; mesepisternum and mesepimeron black, the latter usually paler, mesothoracic spiracle black; metepisternum black; venter black. *Hemelytra:* Clavus dark brown, sometimes paler, first anal vein gray, broad area next to claval suture gray; corium gray, distal half with a dark brown spot, gray areas with small brown spots at setal bases, embolium white, mesal area on distal portion of embolium black, area at corium-membrane boundary dark brown, shiny; cuneus mostly white, apically dark brown; membrane brown, veins dark brown. *Legs:* Coxae dark orange, darker proximally; trochanters black, proximal portion weakly pale; femora orange, proximally black, distally with a narrow dark area; tibiae and tarsi black. ABDOMEN: Black, sternites posteriorly with narrow pale margin. GENITALIA: Genital capsule black; proctiger dark brown; parameres black.

Female: Similar to male, but wider, total length 3.19–3.48. COLORATION: Similar to male. ABDOMEN: Mostly black, dorsal margin of sternites and area around spiracles whitish, sometimes sternites II–VI medially pale; subgenital plate and ovipositor black.

DISTRIBUTION: Same as genus (fig. 41).

HOSTS: Few host-plant data exist for *O. splendida*. It has been found on *Dalea formosa* (Fabaceae), with a single record on *Chamaesaracha* sp. (Solanaceae).

DISCUSSION: Although the holotype is a female, I was able to associate males and females of this species based on coloration, in particular the gray hemelytra with brown spots on the base of the setae and of the orange femora (fig. 3). Some of the specimens examined are teneral, and thus are in poor condition due to shriveling and pale coloration. More collecting in late summer may produce better series with accurate host-plant data.

HOLOTYPE FEMALE: **USA: New Mexico:** Albuquerque, 27 Aug 1909, "*Hadronema* n. sp.", 492, "*H. splendida* type n. sp. gibson"

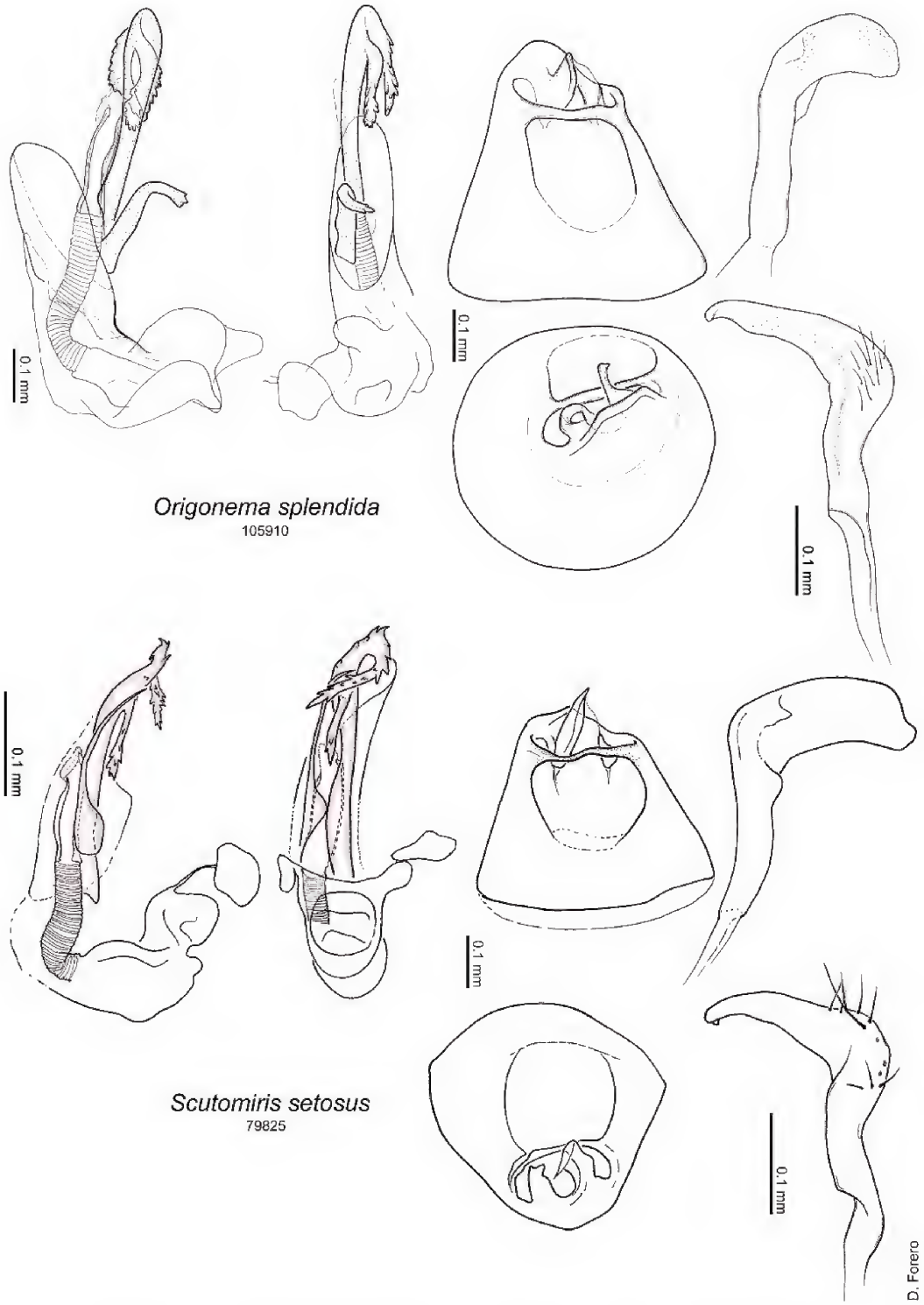

Fig. 43. *Origonema splendida* and *Scutomiris setosus*. Male genitalia: vesica, lateral right and dorsal views; genital capsule, dorsal and posterior views; right and left parameres.

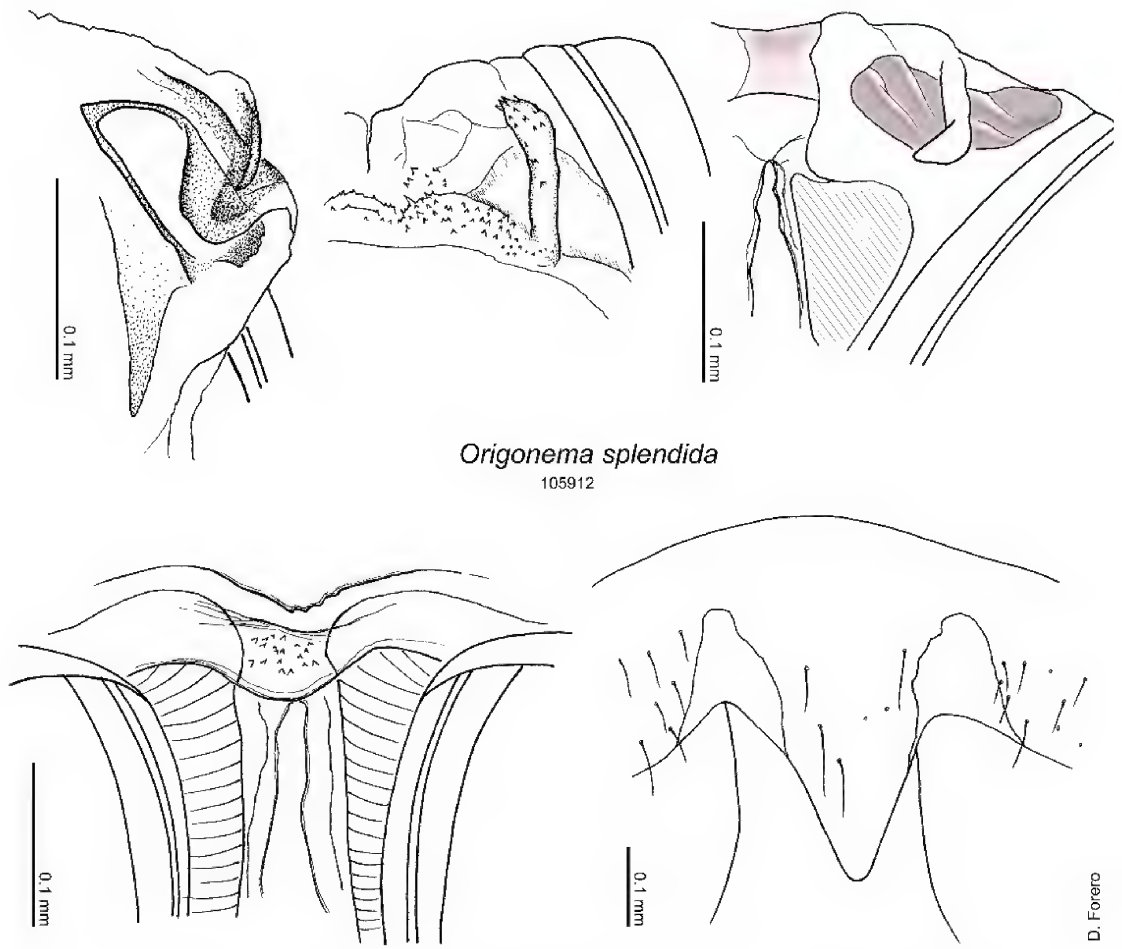

Fig. 44. *Origonema splendida*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, and sigmoid process, anterior view, schematic; anterior wall, posterior view; subgenital plate, ventral view.

det. H. Gibson, Type No. 22168 U.S.N.M., 1♀ (AMNH_PBI 00160639) (USNM).

OTHER SPECIMENS EXAMINED: **MEXICO: Chihuahua:** Chihuahua, 28.63333°N 106.08333°W, 1402 m, 29 May 1964, L.A. Kelton, 1♀ (AMNH_PBI 00103948) (CNC). **Durango:** Reserva Biosfera Mapimi near Ceballos, 26.91141°N 103.67475°W, 23 Aug 1991, J.G. Rozen, *Chamaesaracha* sp. (Solanaceae), 1♀ (AMNH_PBI 00101323) (AMNH). **USA: Arizona:** ***Cochise Co.:*** Ramsey Canyon, Huachuca Mountains, 31.4626°N 110.28952°W, 01 Sep 1927–02 Sep 1927, J.C. Bradley, 2♀ (AMNH_PBI 00125473, AMNH_PBI 00125474) (CUIC). **New Mexico:** ***Dona Ana Co.:*** 12 mi W of Santa Teresa, 31.80027°N 106.90305°W, 1260 m, 16 Aug 2000, Rodriguez, Ohmann, Woolley, 1♀ (AMNH_PBI 00105919) (TAMU); 16 Aug 2000, J.C. Schaffner, 3♂ (AMNH_PBI 00105908–AMNH_PBI 00105910), 8♀ (AMNH_PBI 00105911–AMNH_PBI 00105918) (TAMU); 16 Aug 2000, R.R. Kula, 2♂ (AMNH_PBI 00105921, AMNH_PBI 00105922), 1♀ (AMNH_PBI 00105920) (TAMU); 16 Aug 1999, R. Wharton, 2♂ (AMNH_PBI 00105942, AMNH_PBI 00105943), 5♀ (AMNH_PBI 00105944–AMNH_PBI 00105948) (TAMU). ***Socorro Co.:*** Acornilla rest stop, on Route 25, 34.30527°N 106.89°W, 24 Aug 1998, M.D. Schwartz, *Dalea formosa* Torr. (Fabaceae), 1♂ (AMNH_PBI 00103944), 3♀ (AMNH_PBI 00103945–AMNH_PBI 00103947) (CNC). ***Valencia Co.:*** Belen, 34.66278°N 106.77583°W, 07 Jan 1947, R.H. Beamer, 1♀ (AMNH_PBI 00075216) (KU). Los Lu-

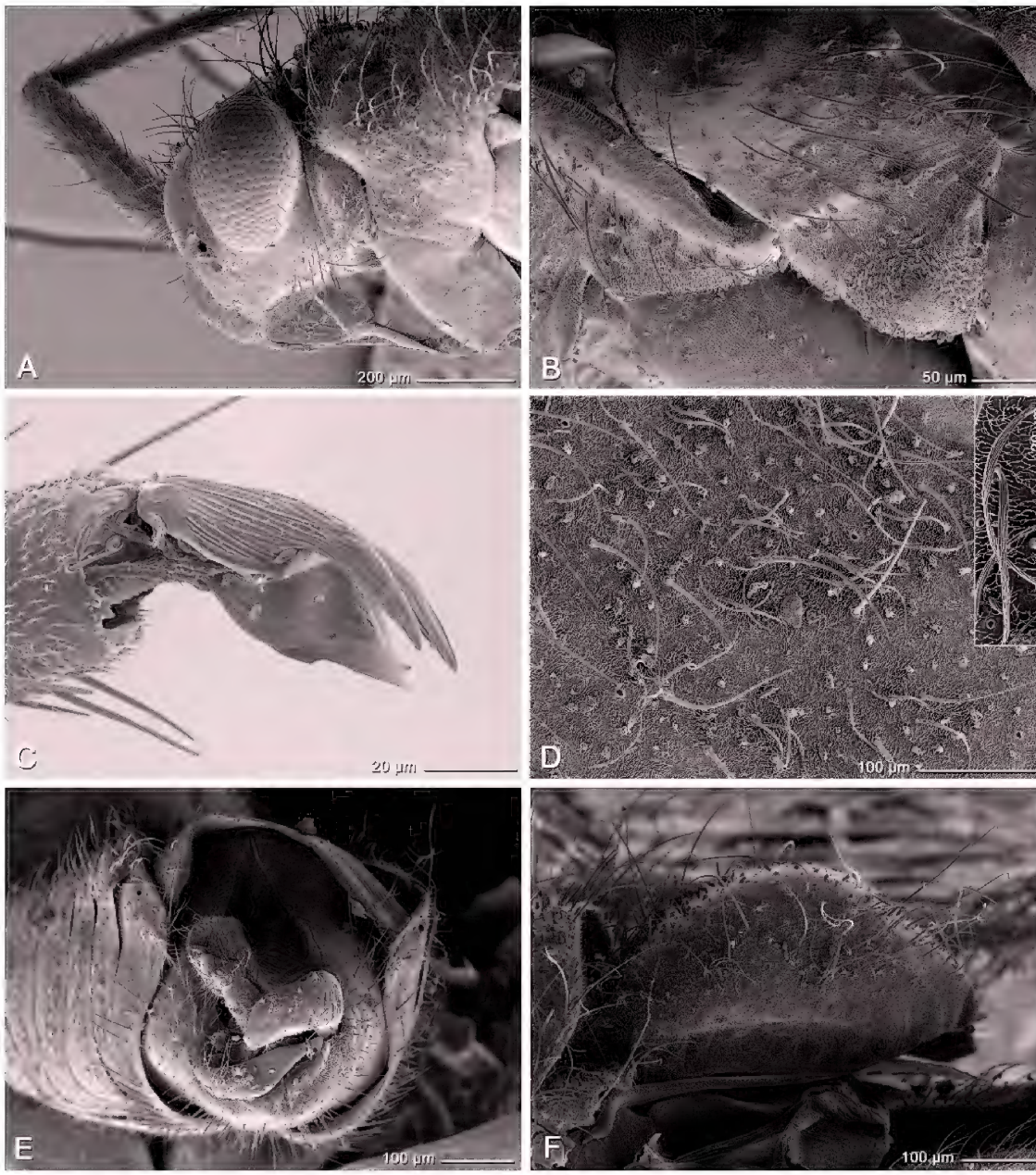

Fig. 45. *Scutomiris setosus*. **A**. Head and pronotum, lateral view. **B**. Mesepimeron and metepisternum showing evaporatory area and peritreme. **C**. Pretarsus. **D**. Vestiture on hemelytron, with inset of detailed sericeous setae. **E**. Genital capsule, posterior view. **F**. Scutellum, lateral view.

nas, 34.80611°N 106.73333°W, 1480 m, 08 Sep 1931, H.H. Knight, 1♀ (AMNH_PBI 00106881) (USNM). **Texas:** Unknown locality, Sep 1940, S.E. Jones, 1♂ (AMNH_PBI 00106878), 2♀ (AMNH_PBI 00106879, AMNH_PBI 00106880) (USNM).

Scutomiris, gen. nov.

Type species: *Scutomiris setosus*, sp. nov.

DIAGNOSIS: Recognized by the swollen scutellum (fig. 45F); the vestiture composed of long erect simple setae and decumbent

short sericeous setae (fig. 45D); and by the elongate and acute right spicule of the vesica (fig. 43).

Scutomiris is easily distinguished among members of the *Hadronema* group by the combinations of characters mentioned above. The structure of the male genitalia is similar to *Daleapidea*, *Hadronemidea*, and *Origonema*, but *Scutomiris* is distinguished by the elongate and acute right spicule nearly reaching the apex of the left spicule, the subequal nonexpanded rami of the left spicule that are turned to the right over it, and by the dorsal opening of the phallotheca almost reaching the phallobase, having a lateral left protuberance (fig. 43). *Scutomiris* females can be distinguished from other females of the *Hadronema* group by the position of the ovipositor, which is closer to the anterior end than to the apical segments of the abdomen. *Scutomiris* externally resembles *Tupimiris* Carvalho and Schaffner, 1973 due to the swollen scutellum and dorsum covered by sericeous setae (fig. 47C–F). Nevertheless, in *Tupimiris* the structure of the scutellum (fig. 47C, D) and male genitalia are different (fig. 48). Additionally, *Tupimiris* lacks a supragenital bridge and the particular structure the parameres of other members of the *Hadronema* group.

DESCRIPTION: *Male:* Elongate ovoid, medium-sized, total length 3.09–3.45. COLORATION: Black with brown and pale brown areas (fig. 3). SURFACE AND VESTITURE: Head shiny, dorsum and remaining areas dull, beset with microtrichia; vestiture composed of two types of setae, long delicate semierect simple setae and short decumbent sericeous setae on dorsum, densely set on pronotum, scutellum, and hemelytra (fig. 45D). STRUCTURE: HEAD (fig. 45A): Transverse, strongly declivent; clypeus weakly protuberant, not visible in dorsal view; frons strongly convex; vertex almost flat, weakly concave next to eyes; frons and vertex with scattered simple setae; transverse carina weakly impressed, with long simple setae; mandibular and maxillary plates small, about a third of height of head, apices rounded; buccula not expanded laterally, with few short simple setae; gena with an area of long simple setae extending below eyes; gula extremely short; eyes ovoid in lateral view, nearly round in dorsal view, reaching anterior margin of pronotum; labrum small, shorter than buccula, narrow, apex acute; labium barely surpassing procoxa, segments II and IV sparsely beset with short setae, remaining segments glabrous; antennal segment I longer than head length, greater in diameter than II, II the longest, about 2.5 times as long as I, III weakly shorter than II, IV the shortest and lesser in diameter. THORAX: Collar narrow, flat, not clearly visible in dorsal view due to setation; calli nearly flat, shiny, with few setae, transverse line between calli and posterior lobe of pronotum deeply impressed; pronotum trapezoidal, anterior angles broadly rounded, posterior ones rounded, lateral margins rounded, ecarinated, nearly straight, posterior lobe of pronotum weakly inclined, surface smooth, posterior margin of pronotum straight in dorsal view, arcuate in transverse section (fig. 45F); mesoscutum usually covered by posterior margin of pronotum; scutellum triangular, lateral margins weakly arcuate, disc strongly swollen, nearly hemispherical, apex rounded (fig. 45F); pleural area with short erect simple setae; propleuron densely setose; metepisternum beset with sparse long microtrichia in addition to the long simple setae; metathoracic scent-gland evaporatory area rounded on dorsal margin, not reaching level of dorsal portion of metacoxa (fig. 45B); peritreme relatively small, not protruding, densely covered with microtrichia (fig. 45B); prosternum with short simple setae. *Hemelytra:* Nearly parallel; clavus elevated with respect to corium and deflexed along claval suture; corium nearly flat, gently deflexed toward embolium; cuneus weakly deflexed, about as long as wide; membrane barely less than half as long as hemelytron. *Legs:* Coxae elongate, with sparse short simple setae; trochanters ovoid; femora nearly cylindrical, weakly tapering distally, weakly compressed anteroposteriorly, covered with short simple setae; profemur about as long as mesofemur; metafemur barely longer than pro- and mesofemur; tibiae slender, straight, covered with short simple setae, meso- and metatibia in addition covered with spiniform setae; pro- and mesotibia nearly as long as pro- and mesofemur; metatibia almost twice as long as metafemur; tarsi long, delicate, cylindrical,

first tarsomere barely shorter than second, third the longest, ventral surface of first tarsomere of foreleg with short sparse setae; pretarsus as in figure 45C. ABDOMEN: Densely covered with short simple setae; sternite VIII emarginate posteriorly, setae arising from posterior margin and directed cephalad instead of caudad. GENITALIA: Genital capsule subtriangular, about as long as wide in dorsal view; aperture big, anterior margin not well sclerotized, weakly turned left (figs. 43, 45E); ventrolateral right projection small, almost inconspicuous, blunt (fig. 43); proctiger surpassing apex of genital capsule (fig. 45E); cuplike sclerite surpassing apex of genital capsule, left portion reduced, right portion greatly enlarged, bases barely projecting cephalad of supragenital bridge (fig. 43); supragenital bridge slender, well sclerotized, located above insertions of parameres (fig. 43); right paramere inserted weakly above left relative to horizontal plane (figs. 43, 45E); left paramere sickle-shaped, apicoventral process acute (fig. 43); right paramere hatchet-shaped in medial view, strongly L-shaped, distal half as long as body with subparallel margins, flattened, body elongated, apex sinuate with a proximal small almost truncate projection, small projection on dorsal angle acute and prolonged cephalad as a small flange on the body (fig. 43); phallotheca nearly cylindrical, with a subbasal right dorsolateral blunt protuberance, sclerotized dorsally and ventrodistally, poorly so on ventroproximal surface; opening weakly inclined, directed weakly to the right, subparallel, long almost reaching level of attachment with phallobase, not well sclerotized on anterior margin (fig. 43); vesica with two well-sclerotized spicules, left and right; left spicule gently expanded apically and denticulate, with one apical and one preapical prolongation (rami) directed cephalad, both rami thin and heavily denticulate, weakly expanded distally, surpassing apex of right spicule, apical ramus strongly turned right over main body of spicule, preapical ramus nearly straight, not curved (fig. 43); right spicule elongate, acute and tapering apically, not denticulate, nearly reaching apical prolongation of left spicule, basally expanded as a quadrate process (fig. 43).

Female: Similar in coloration and structure to male, but wider, weakly longer, total length 3.04–3.44. COLORATION: As in male (fig. 3). SURFACE AND VESTITURE: As in male. STRUCTURE: HEAD: Antennal segment I barely greater in diameter than II, slender and shorter as in male. GENITALIA (fig. 46): Subgenital plate nearly twice as long as wide, apex roundly acute, reaching middle of sternite VIII; base of ovipositor located at a longitudinal anterior point of abdomen, close to apex of metacoxa; interramal sclerites subquadrate, nearly rhomboidal; dorsal lobes of interramal sclerites long, in dorsal view margins subparallel, uniformly beset with microtrichia on surface, apex weakly roundly acute; sigmoid process grossly denticulate, dorsal margin of interramal sclerites neither with tubercles nor microtrichia; medial process neither distinct nor sclerotized; dorsal labiate plate without any sclerotized modified structures; sclerotized rings ovoid, well sclerotized, posterior medial margin roundly produced, lateral margin well sclerotized, recurved, and nearly reaching medial margin; accessory sclerite not enlarged, nearly longitudinal, internal dorsomedial area covered with microtrichia; ventral labiate plate not modified; inner margin of first gonapophyses symmetrical; anterior wall membranous, appearing not modified.

DISTRIBUTION: Known only from southern Baja California Sur, Mexico (fig. 41).

HOST ASSOCIATIONS: No host-plant data have been procured for this taxon.

ETYMOLOGY: The generic name is formed from the Latin "scutum", meaning shield, in reference to the greatly inflated scutellum, and "miris", meaning plant bug. The gender is masculine.

DISCUSSION: *Scutomiris* is regarded as a new genus because it cannot be accommodated under any of the previously known taxa of the *Hadronema* group (see "Phylogenetic Analysis" below). It shares with *Aoplonema* two types of setae on dorsum, a lateral protuberance on the left side of the phallotheca, and a similar head shape. *Scutomiris*, however, differs in the structure of male genitalia, with the vesica having two sclerites.

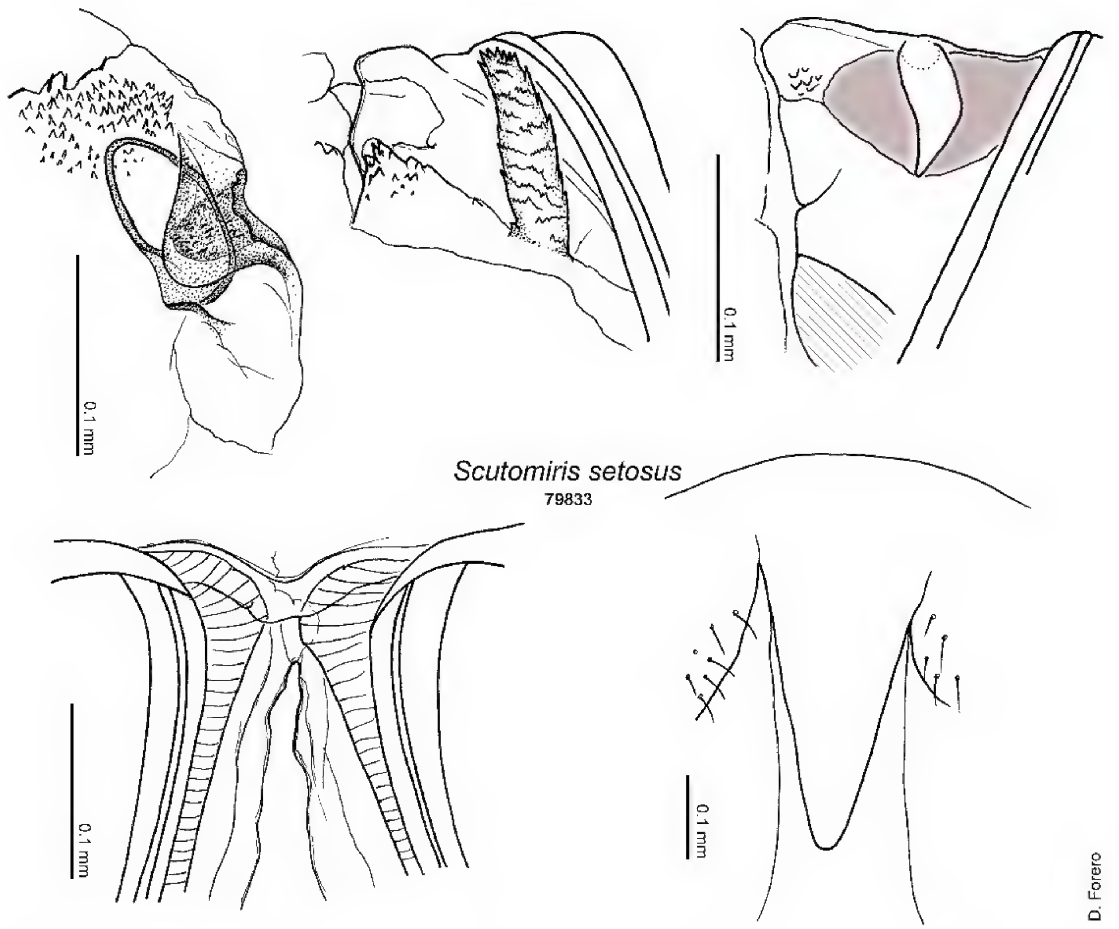

Fig. 46. *Scutomiris setosus*. Female genitalia: right sclerotized ring of dorsal labiate plate, dorsal view; interramal dorsal sclerite lobe, dorsal view; interramal sclerite with dorsal lobe, anterior view, schematic; anterior wall, posterior view; subgenital plate, ventral view.

Scutomiris setosus, sp. nov.
Figures 3, 41, 43, 45, 46

DIAGNOSIS: See generic diagnosis.

DESCRIPTION: *Male:* Total length 3.09–3.45. COLORATION: Black with brown areas (fig. 3). HEAD: Shiny black; clypeus dull; mandibular and maxillary plates apically dark brown; labrum brown; labium pale brown, segments III–IV dark brown; antennae dark brown. THORAX: Collar and pronotum black; mesoscutum and scutellum black; proepisternum, proepimeron, and mesepisternum black, ventral portion of mesepisternum pale; meso- and metapleuron black, mesothoracic spiracle black; evaporatory area and peritreme dark brown; venter black. *Hemelytra:* Clavus brown; corium and cuneus light brown, weakly translucent, area posterior to costal fracture translucent, posterior margin of corium and cuneus brown; membrane and veins pale brown. *Legs:* Coxae brown, apically pale; trochanters pale brown; femora and tibiae orange brown, tibiae weakly darker; tarsi dark brown. ABDOMEN: Dark brown, area around spiracles pale brown, posterior margin of sternites weakly pale. GENITALIA: Genital capsule black; proctiger dark brown, basally pale; parameres brown.

Female: Similar to male in structure and coloration, barely larger, more ovoid, total length 3.04–3.44. COLORATION (fig. 3): HEAD: Usually area in front of transverse

carina on vertex brown or paler. THORAX: *Hemelytra:* Corium weakly darker medially on lateral margin; cuneus darker on lateral margin.

DISTRIBUTION: *Scutomiris setosus* is known only from three localities in southern Baja California Sur, Mexico (fig. 41).

HOSTS: See generic description.

ETYMOLOGY: The name is taken from the Latin "seta", meaning hair, in reference to the hairy appearance of the body.

DISCUSSION: *Scutomiris setosus* is known only from a few specimens. Future fieldwork is needed to find larger series of specimens and determine host plants.

HOLOTYPE MALE: **MEXICO: Baja California Sur:** 2 km S of La Ribera, [23.56529°N 109.58333°W], 09 Nov 1982, C.E. Griswold, Holotype *Scutomiris setosus*, n. sp. det. D. Forero (red label), 1♂ (AMNH_PBI 00079827) (UCB).

PARATYPES: **MEXICO: Baja California Sur:** 2 km S of La Ribera, 23.56529°N 109.58333°W, 09 Nov 1982, C.E. Griswold, 3♂ (AMNH_PBI 00079825, AMNH_PBI 00079826, AMNH_PBI 00079855), 8♀ (AMNH_PBI 00079828–AMNH_PBI 00079835) (UCB). 30 km E of Santiago, Rancho las Barracas, 23.46639°N 109.42154°W, 06 Nov 1982–08 Nov 1982, collector unknown, 2♀ (AMNH_PBI 00079887, AMNH_PBI 00079888) (UCB). 4.5 mi W on ramal a los Naranjos, 23.27118°N 109.82748°W, 13 Sep 1988, E.G. Riley, 3♂ (AMNH_PBI 00105893–AMNH_PBI 00105895), 12♀ (AMNH_PBI 00105896–AMNH_PBI 00105907) (TAMU).

Incertae Sedis

Hadronema cinerescens Scudder

Hadronema cinerescens Scudder, 1890: 370 [n. sp.]; Carpenter, 1992: 275 [list].

DISCUSSION: Scudder (1890) described this species from Oligocene deposits of Florissant (Carpenter, 1992). He stated a probable affinity of the fossil species with the genus *Hadronema* and pointed out the "doubtful" position within the genus. The outline drawing and deficient description presented by Scudder prevent further conclusions about the identity of this species. The syntypes (Scudder, 1890) deposited at the Museum of Comparative Zoology at Harvard have not been examined. No other fossil species has been included in *Hadronema* (Carpenter, 1992).

Additional Taxa

Tupimiris scutellatus Carvalho and Schaffner
Figures 47, 48

Tupimiris scutellatus Carvalho and Schaffner, 1973: 35 [n. sp.]; Schuh, 1995: 201 [catalog].

DIAGNOSIS: Recognized by the round sensory lobe on the right side of the genital capsule, bearing thick long setae (fig. 48); the swollen disc of scutellum (fig. 47C–D); the long simple setae intermixed with decumbent sericeous setae on dorsum (fig. 47E, F); the cylindrical phallotheca with a long dorsal opening directed to the right (fig. 48); and the single, elongate, and acute spicule on the vesica (fig. 48).

Tupimiris scutellatus vaguely resembles *S. setosus*, mainly because of the short head and swollen scutellum. *Tupimiris scutellatus* has a strongly vertical head and more prominent eyes, in particular laterally (fig. 47A, B), than does *S. setosus*. The disc of the scutellum of *T. scutellatus* is enlarged (fig. 47C), but in *S. setosus* it is greatly inflated (fig. 45F). In *T. scutellatus* the vestiture on dorsum is less dense, with nearly straight decumbent sericeous setae (fig. 47E, F), whereas in *S. setosus* the vestiture is denser, and the sericeous setae are longer and contorted (fig. 45D). The genital capsule of *T. scutellatus* is quadrangular without a supragenital bridge (fig. 48), whereas in *S. setosus* it is subtriangular, and a supragenital bridge present (fig. 43). Furthermore, the structure of the vesica and parameres (fig. 48) is different from *S. setosus* (fig. 43). Females are not known for this taxon, so comparisons cannot be made.

DISTRIBUTION: Only known from Santa Catarina, in southern Brazil (Carvalho and Schaffner, 1973).

HOSTS: Not known.

DISCUSSION: Only the diagnosis and comparative notes are provided here, as Carvalho and Schaffner (1973) provided the description for this species. As discussed above, *T. scutellatus* is not related to the *Hadronema*

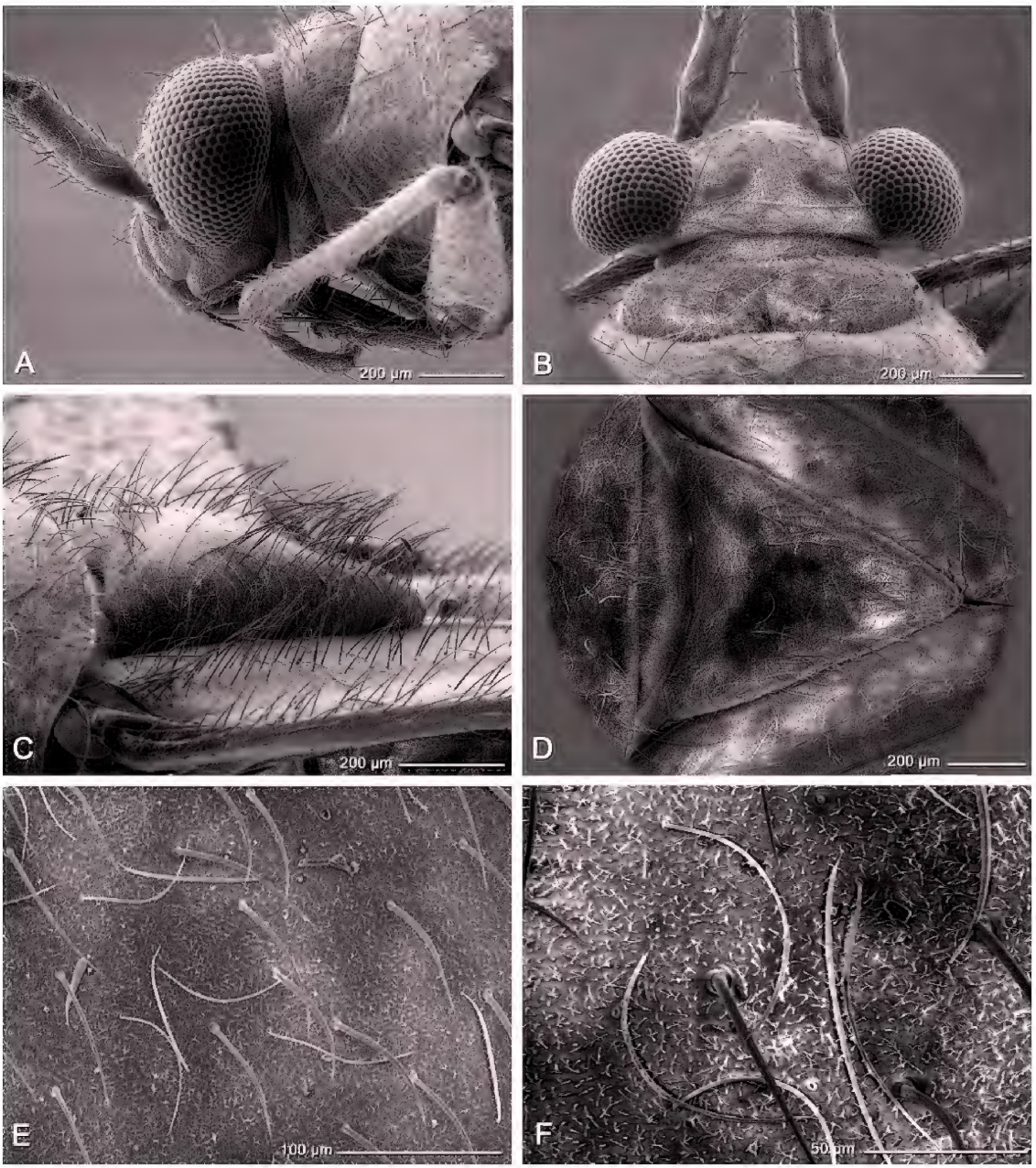

Fig. 47. *Tupimiris scutellatus*. **A**. Head and pronotum, lateral view. **B**. Dorsal view of head. **C**. Lateral view of scutellum. **D**. Dorsal view of scutellum. **E**. Setae on hemelytron. **F**. Detail of setae on hemelytron.

group as shown by the absence of a supragenital bridge and different structure of the parameres, in particular of the right one.

HOLOTYPE MALE: **BRAZIL: Santa Catarina:** Nova Teutonia, [27.18333°S 52.38333°W], 642 m, Dec 1970, F. Plaumann, 1♂ (AMNH_PBI 00174932) (MNRJ).

PARATYPES: **BRAZIL: Santa Catarina:** Nova Teutonia, 27.18333°S 52.38333°W, 642 m, Dec 1970, F. Plaumann, 1♂ (AMNH_PBI 00105588) (TAMU); Nov 1972, F.

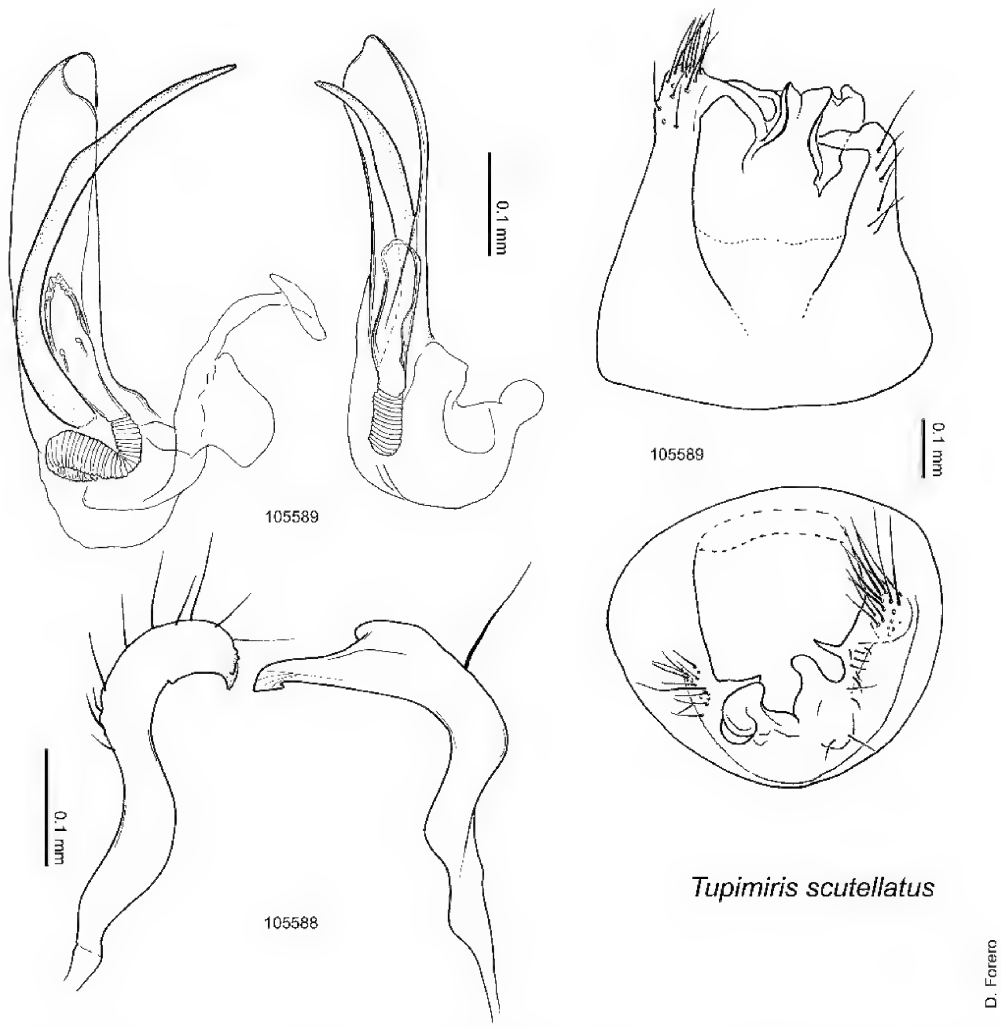

Fig. 48. *Tupimiris scutellatus*. Male genitalia: phallus and vesica, lateral right and dorsal views; genital capsule, dorsal and posterior views; right and left parameres, dorsal view.

Plaumann, 1♂ (AMNH_PBI 00105589) (TAMU).

Lopidea robusta (Uhler)

Hadronema robusta Uhler, 1894: 250 [n. sp.].
Lopidea robusta: Van Duzee, 1928: 182 [new combination]; Carvalho, 1958: 87 [catalog]; Knight, 1962: 32 [discussion, paramere illustration]; Schuh, 1995: 138 [catalog].

Discussion: Van Duzee (1928), while describing *Hadronema uhleri*, mentioned that *Hadronema robusta* Uhler was in fact a *Lopidea* species. Knight (1962: 32) stated that he examined the "type" of *L. robusta* in the collection of the California Academy of Science (CAS) and gave an illustration of the right paramere (his fig. 16). In doing this, Knight validated a lectotype designation for *L. robusta* (ICZN article 74.5.). The examined specimens from CAS have affixed lecto- and allotype labels of "*robusta*", which match Uhler's description and locality data, and the male matches Knight's paramere illustration. It is probable that Van Duzee affixed those lecto- and allotype labels while describing *A. uhleri* (see Van Duzee, 1928). Asquith (1991) did not treat or discuss *L. robusta* in his monograph of *Lopidea*, because this species is only known from Baja

California in Mexico, an area outside the scope of his paper.

LECTOTYPE MALE: **MEXICO: Baja California Sur:** San Jose del Cabo, [23.05°N 109.68333°W], [G. Eisen], Uhler type, Lectotype "*robusta*", "*Hadronema robusta* Uhler San José del Cabo", California Academy of Sciences Type No. 551, 1♂ (AMNH_PBI 00077897) (CAS).

PARALECTOTYPE: **MEXICO: Baja California Sur:** San Jose del Cabo, [23.05°N 109.68333°W], [G. Eisen], Uhler type, Allotype "*robusta*", California Academy of Sciences Type No. 552, 1♀ (AMNH_PBI 00077898) (CAS).

PHYLOGENETIC ANALYSIS

TAXA

For the phylogenetic analysis, 24 terminals were considered: 5 as outgroups and 19 as the ingroup. All the species of *Hadronema* group were included in the phylogenetic analysis. Only *H. cinerescens*, a fossil species of uncertain position (see above) (Scudder, 1890), was excluded. For the outgroup, five species in four genera of the *Orthotylus* group of Schuh (1974) were selected: *Lopidea robiniae* (Uhler, 1861), *Orthotylus marginalis* Reuter, 1883, *Slaterocoris atritibialis* (Knight, 1938), and two unidentified species of *Araucanocoris* Carvalho, 1983. The tree was rooted with *O. marginalis*. Because a phylogenetic framework for the Orthotylini has not yet been proposed, a justification for the selection of the outgroups seems necessary. *Lopidea* externally resembles *Hadronema*, in particular the head structure and coloration (Asquith, 1991). Some affinities have been proposed between *Lopidea* and *Hadronema* (Knight, 1968), although later rejected, but not under a phylogenetic framework (Schuh, 1989; Asquith, 1991). *Lopidea* and *Slaterocoris* have in turn been proposed as related (Kelton, 1959). *Orthotylus marginalis* was included, as it is the type species of *Orthotylus* Fieber, which is the type genus of the subfamily and nominal tribe. *Araucanocoris* was included to have a Neotropical representative. No hypotheses of relationship have previously been proposed for the taxa considered here.

DATA

A morphological matrix with 69 characters, coded from the vestiture, head, thorax, legs, and male and female genitalia (tables 3, 4), was constructed using Winclada (Nixon, 2002) as the interface. Characters were mainly binary ones (79.5%) (table 4). Those coded as multistate (20.5%) were considered as nonadditive, as is common for morphological characters (e.g., Goloboff, 1997). Inapplicable data account for 4% of the total information coded in the matrix. Some characters were uninformative, so they were deactivated from the matrix and not used during the analysis. In the consensus tree (fig. 49), all characters supporting nodes in the unambiguous optimization are presented.

ANALYSIS STRATEGY

Parsimony was used as the optimality criterion. All tree searches were completed in NONA (Goloboff, 1999) spawned from WinClada (Nixon, 2002). A heuristic search was carried out holding a maximum of 20,001 trees in memory, with 1000 replications and 20 trees to hold per replication, in random addition sequence. For each replication a Subtree Pruning and Regrafting and a Tree Bisection and Reconnection swapping were performed (Swofford et al., 1996). In the final trees all unsupported branches were collapsed.

RESULTS

The analysis produced six most parsimonious trees. The strict consensus tree has 150 steps, a consistency index of 60, and a retention index of 76 (fig. 49). Nodes of major clades are numbered 1–9. Main characters, and character numbers (in parentheses), supporting these nodes are indicated as follows:

Node 1. *Hadronema* group: Presence of a supragenital bridge in the genital capsule (34); sclerotized part of the ductus seminis long (38); dorsal apophysis of right paramere directed medially (49); apex of right paramere flattened (50); anterior medial margin of the first gonapophysis in the female symmetrical (62).

Node 2. *Aoplonema*: Vesica with a single spicule (44).

Node 3: Supragenital bridge strongly sclerotized (35); opening of the phallotheca reclined and oval (41); proximal, ventral surface of phallotheca weakly sclerotized (43); dorsal lobe of interramal sclerite with medial margin slightly sinuate, nearly straight (55).

Node 4: Vestiture on dorsum composed of simple setae only, sericeous setae absent (1); phallotheca cylindrical, without lateral protuberances (40).

Node 5. *Daleapidea*: Protibia with distal and ventral area flattened and laterally expanded (3); first antennal segment of male subbasally enlarged (14); genital capsule longer than wide (29).

Node 6: Mesofemur in male with long setae, as long as femora width (8); mesotrochanter in male with setae as long as or longer than trochanteral width (9).

Node 7: Simple setae on hemelytra erect, bristlelike (0); posterior margin of vertex with bristlelike setae (20).

Node 8. *Hadronemidea*: Mesotibia in male curved inward (6); setae on mesotibia in male with setae twice as long as tibial width (7); anteocular region of head long, about two-fifths of head length (11); antennae length subequal to cuneus-clypeus length (13); eyes small, neither reaching dorsal margin of head (21) or posterior margin (22).

Node 9. *Hadronema*: Profemur in male ventrally with a basal, prominent, bifid tubercle (2); secondary gonopore opening at the base of the spicules (37); anterior wall in the female with a central sclerotized plate bearing a tubercle directing posteriad (58).

The consensus tree is extensively resolved within the *Hadronema* group. The only polytomy among generic groups is at node 7 (fig. 49) in which relationships among *Origonema*, *Hadronemidea*, and *Hadronema* cannot be resolved. *Hadronema* (node 9) also shows poor resolution of species relationships. The aim of the analysis was focused on resolution of generic relationships, so having unresolved nodes within *Hadronema* does not affect the higher level conclusions.

Discussion

Hadronema Group: In the phylogenetic hypothesis presented above, the *Hadronema* group is a monophyletic group in relation with other species of the *Orthotylus* group included as outgroups, and it is supported with several synapomorphies (fig. 49). The presence of a supragenital bridge in the genital capsule is a homoplastic character supporting this clade. This structure is not present in any of the other Nearctic Orthotylini examined or in any of the known Palearctic genera (Konstantinov, personal commun.). It is present nonetheless in at least one of the examined species from Argentina that can be assigned to *Araucanocoris* near *A. subandinus* (i.e., *Araucanocoris* sp. 1), and in *Sagittacopula*, a newly described Australasian genus known from northern Australia and Papua New Guinea (Wall, 2007). Dissections of other Argentinean specimens show that "*Araucanocoris*" does not share a common male genitalia pattern, and the putative species are grouped only by the strong sexual wing dimorphism between males and females, and by the particular vestiture on the dorsum (Carvalho, 1983; Carvalho and Carpintero, 1992). These examined specimens do not exhibit the supragenital bridge or paramere structure of the *Hadronema* group. *Sagittacopula* does not share the right paramere and genital capsule structure of the *Hadronema* group. The two species included in *Sagittacopula* have a rather large right paramere curved anterodorsally, and the genital capsule has a dorsal left protuberance (Wall, 2007).

The structure of the right paramere is one of the characters that unambiguously supports the monophyly of the *Hadronema* group. In the species of "*Araucanocoris*" that bear a supragenital bridge, the right paramere is strongly C-shaped in lateral view due to the extension of the dorsal process. The structure of the right paramere as documented for members of the *Hadronema* group is not shared with any other Orthotylini group known, in particular by the hatchet shape, its flattened apex, and the dorsal, medially directed tubercle.

The left paramere is uniform among the species of the group in being sickle-shaped without any protuberances basally, and with an apically ventral denticle. *Daleapidea albescens* is the only species of the *Hadronema* group that bears a medial dorsal protuberance on its left paramere. Of the species

TABLE 3
Characters and Character States List for the *Hadronema* Group

VESTITURE

0. Simple setae on hemelytra: decumbent = 0; erect = 1.
1. Sericeous setae on hemelytra: not present = 0; present = 1.

LEGS

2. Profemur in males: surface ventrally smooth, without protuberances = 0; ventrally with a basal, prominent, bifid tubercle = 1.
3. Protibia in males: apicoventral area nearly cylindrical = 0; apicoventral area flat, expanded laterally = 1.
4. Expanded area of protibia in males: with dense enlarged setae laterally = 0; with not so dense enlarged setae laterally = 1.
5. Foreleg first tarsomere in males: expanded laterally, flat, covering base of 2nd segment, tenent setae = 0; not expanded, cylindrical, normal setae on ventral surface = 1.
6. Middle tibia in males: curved inward = 0; straight, or nearly so = 1.
7. Setae on mesotibia in males: twice as long as tibia width = 0; no longer than tibia width = 1.
8. Setae on mesofemur in males: as long as femoral width (long hairs) = 0; shorter than femoral width (short hairs) = 1.
9. Setae on mesotrochanter in males: as long, or longer, than trochanteral width = 0; shorter than trochanteral width = 1.
10. Color of metafemur on basal half: black = 0; orange = 1; brown = 2; yellow = 3; red = 4. [nonadditive].

HEAD

11. Anteocular region of head in males: about one-third the length of head = 0; less than one-third the length of head = 1; about two-fifths the length of head = 2. [nonadditive].
12. Frons in dorsal view: convex = 0; flat = 1; strongly convex = 2. [nonadditive].
13. Antennae length: less than cuneus-clypeus length = 0; nearly the same as cuneus-clypeus length = 1.
14. First antennal segment in males: enlarged subbasally = 0; not enlarged subbasally, nearly cylindrical = 1.
15. Length of antennal segment II in males: shorter than head width = 0; longer than head width = 1.
16. Antennal segment II in males: not expanded apically = 0; expanded apically = 1.
17. Vertex, posterior margin: with transverse carina = 0; nearly flat, not elevated = 1.
18. Transverse carina: elevated and impressed, sharp = 0; elevated and impressed, not sharp = 1; elevated, not impressed = 2; barely elevated = 3. [nonadditive].
19. Length of setae on posterior margin of vertex: short = 0; long = 1.
20. Setae on posterior margin of vertex: not stiff = 0; stiff = 1.
21. Eyes in lateral view: reaching dorsal margin = 0; not reaching dorsal margin = 1; surpassing dorsal margin = 2. [nonadditive].
22. Eyes in dorsal view: reaching posterior margin of head = 0; not reaching posterior margin of head = 1.
23. Buccula: with short sparse setae = 0; with dense long setae = 1.

THORAX

24. Disc of scutellum in lateral view: flat = 0; swollen = 1.
25. Metepisternum vestiture: sparse macrotrichia = 0; dense macrotrichia = 1; macrotrichia absent, surface smooth = 2. [nonadditive].
26. Relative size of peritreme: normal size, adjacent evaporatory area wide = 0; large, reduced adjacent evaporative area = 1; absent, not distinguished from adjacent metepisternum, no evaporatory area = 2. [nonadditive].
27. Cuneus: as long as wide = 0; longer than wide = 1.

MALE GENITALIA

28. Apex of genital capsule: subtriangular = 0; subquadrangular = 1; triangular = 2. [nonadditive].
29. Genital capsule length: not elongate (about as long as wide) = 0; elongate (1.5 times longer than wide at base) = 1.
30. Genital capsule aperture: vertical = 0; reclined = 1.
31. Genital capsule aperture: proximal margin: well sclerotized, edge defined = 0; weakly sclerotized, edge not well defined = 1.
32. Genital capsule aperture margin: with tubercle(s) = 0; entire = 1.
33. Left paramere insertion in genital capsule: nearly ventral = 0; lateral = 1.
34. Supragenital bridge: absent = 0; present = 1.
35. Sclerotization of supragenital bridge: strong = 0; weak = 1.
36. Genital capsule: ventral left side: sensory rounded lobe present = 0; surface not protuberant = 1.
37. Secondary gonopore opening in relation with base of spicules: at base of spicules = 0; distally with respect to base of spicules = 1.
38. Sclerotized part of ductus seminis: not elongate = 0; elongate = 1.

TABLE 3
(Continued)

39. Shape of phallotheca: nearly cylindrical, margins parallel = 0; wider at base than apex = 1.
40. Cylindrical phallotheca: without protuberances = 0; with lateral protuberance on basal left side = 1.
41. Opening of phallotheca: mostly dorsal = 0; apically circular, vertical = 1; reclined, oval = 2. [nonadditive].
42. Dorsal opening of phallotheca: complete = 0; incomplete = 1.
43. Proximoventral surface of phallotheca: well sclerotized = 0; weakly sclerotized = 1.
44. Number of spicules: 2 = 0; 1 = 1.
45. Spicule at apex: without tooth = 0; with tooth (sawlike) = 1.
46. Rami on spicules: absent = 0; present = 1.
47. Direction of rami of left (ventral) spicule: directed caudad = 0; directed cephalad = 1.
48. Right paramere at dorsal margin: margin entire without projections = 0; apophysis present = 1.
49. Right paramere dorsal apophysis: not medially directed = 0; medially directed = 1.
50. Right paramere at apical half: not flat = 0; flattened = 1.
51. Shape of right paramere in medial view: gently curved = 0; hatchet-shaped = 1; clubbed = 2; Y-shaped = 3; chelate = 4. [nonadditive].
52. Left paramere in dorsal view: sinuate = 0; sickle-shaped = 1.
53. Left paramere, ventral surface at apex: without any projections or tubercles = 0; with a tubercle projecting ventrad = 1.
54. Left paramere at base: surface smooth, without apophysis or protuberances = 0; surface with dorsally directed process = 1.

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55. Dorsal lobe of interramal sclerite at medial margin: subbasally enlarged = 0; subapically lobate, deeply cleft = 1; subapically enlarged = 2; broadly rounded = 3; nearly straight, slightly sinuate = 4. [nonadditive].
56. Dorsal lobe of interramal sclerite at lateral margin: curved = 0; subapically enlarged = 1.
57. Dorsal lobe of interramal sclerite at apex: acute = 0; broadly rounded = 1; narrowing distally but not acute = 2; rounded = 3. [nonadditive].
58. Anterior wall: membranous = 0; with a sclerotized central plate = 1.
59. Sclerotized central plate on anterior wall: not transversely divided = 0; transversely divided = 1.
60. Posterior margin of ventral labiate plate: not projected = 0; projecting ventrally into the vestibulum = 1.
61. Sigmoid process: without small spines = 0; with small spines = 1.
62. Anteromedial margin of 1st gonapophysis: symmetrical = 0; asymmetrical = 1.
63. Sclerotized rings: without accessory sclerite = 0; with supralateral accessory sclerite = 1.
64. Accessory sclerite of sclerotized rings: lateral to sclerotized rings = 0; recurved over sclerotized rings = 1.
65. Anteromesal area of sclerotized rings: without field of small spines = 0; with field of small spines = 1.
66. Dorsal labiate plate with medially sclerotized areas: absent = 0; present = 1.
67. Subgenital plate: nearly as long as wide = 0; longer than width at base = 1; wider than length = 2. [nonadditive].
68. Apex of subgenital plate: acute = 0; broadly rounded = 1; truncate = 2. [nonadditive].

included as outgroups, *O. marginalis* and *Araucanocoris* sp. 2 have a dorsally directed processes on the left paramere, but in those species the process is basal and does not bear any long setae. In *D. albescens*, the process is medial and has apically strong setae. I hypothesize that this process is homologous with the dorsomedial sensory area of the left paramere present in other species of the *Hadronema* group. *Slaterocoris atritibialis* also exhibits a sickle-shaped paramere with a dorsomedial sensory area, but in this species the apex of the paramere is expanded apically without any ventral acute process. Only two species of *Hadronema*, *H. militare* and *H. incognitum*, have the left paramere strongly modified from the general structure observed in other species of the genus group. The left paramere is sinuate, not strongly curved (fig. 29), similar to the condition also present in *Hadronemidea echinata* (fig. 30), a derived condition within the *Hadronema* group. The left paramere also resembles the one present in the Neotropical genus *Proboscidotylus* (Henry, 1995). Other non-Orthotylini may exhibit a similar left paramere, as in the Palearctic genus *Dimorphocoris* Reuter, 1890 (Halticini) (Lindberg, 1956; Linnavuori, 1992). It is probable that a sickle-shaped left paramere may be a symplesiomorphy for Orthotylinae, but additional evidence is necessary to test this hypothesis.

TABLE 4
Character Matrix of the *Hadronema* Group

Taxon	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Lopidea robiniae	0	1	0	0	-	1	1	1	1	1	2	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	0	1	0
Orthotylus marginalis	0	0	0	0	-	1	1	1	1	1	3	0	0	0	1	1	0	0	2	1	0	0	0	0	0	1	0	0	1	0
Slaterocoris atritibialis	0	0	0	0	-	1	1	1	1	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	2	0
Araucanocoris sp. 1	0	1	0	0	-	1	1	1	1	1	2	0	0	0	1	1	0	1	-	1	0	0	0	0	0	0	0	0	0	0
Araucanocoris sp. 2	0	1	0	0	-	1	1	1	1	1	2	0	0	0	1	1	0	1	-	1	0	0	0	0	0	0	0	0	0	0
Hadronema militare	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	1	0	1	0
Hadronema incognitum	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	1	0	1	0
Hadronema bispinosum	1	0	1	0	-	0	1	1	0	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0
Hadronema sinuatum	1	0	1	0	-	0	1	1	0	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0
Hadronema pictum	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0
Hadronema simplex	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	1	0	0	0
Hadronema breviatum	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	0	0	0	2	1	1	0	0	0	0	1	1	0	0	0
Hadronema mexicanum	1	0	1	0	-	0	1	1	0	0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	0	0	0	0
Origonema splendida	1	0	0	0	-	1	1	1	0	0	1	0	0	0	1	1	0	0	1	1	1	0	0	0	0	1	1	0	0	0
Hadronemidea echinata	1	0	0	0	-	0	0	0	0	1	0	2	0	1	1	1	0	0	1	1	1	1	1	0	0	1	2	0	0	0
Hadronemidea esau	1	0	0	0	-	0	0	0	1	1	0	2	0	1	1	1	0	0	1	1	1	1	1	0	0	1	2	0	0	0
Aoplonema princeps	0	1	0	0	-	1	1	1	1	1	4	0	0	0	1	1	0	0	2	1	0	0	0	0	0	1	0	0	0	0
Aoplonema rubrum	0	1	0	0	-	1	1	1	1	1	4	1	0	0	1	1	0	0	2	1	0	2	0	0	0	1	0	1	0	0
Aoplonema nigrum	0	1	0	0	-	1	1	1	1	1	2	1	0	0	1	1	0	0	2	1	0	2	0	0	0	1	0	1	0	0
Aoplonemella festiva	0	0	0	0	-	1	1	1	0	0	0	0	2	0	1	1	0	0	3	1	0	0	0	0	0	1	2	0	0	0
Scutomiris setosus	1	1	0	0	-	1	1	1	1	1	2	0	0	0	1	1	0	1	-	1	0	0	0	0	1	0	0	0	0	0
Daleapidea daleae	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	-	0	0	0	0	0	0	1	2	0	1	1
Daleapidea albescens	0	0	0	1	1	1	1	1	1	1	2	0	0	0	0	0	1	0	1	-	1	0	0	0	1	0	1	0	0	0	1
Daleapidea decorata	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	1	0	1	-	1	0	0	0	0	0	1	2	0	1	1

The symmetrical anterior medial margin of the first gonapophysis in the female is a homoplastic character that partially defines the *Hadronema* group. All but one of the outgroup taxa have a highly asymmetrical medial margin. *Araucanocoris* sp. 1 possesses a symmetrical condition, which also occurs in *Mecomma* Fieber, 1858 (Orthotylini) (Pluot-Sigwalt and Matocq, 2006), and may represent a symplesiomorphy for the Orthotylinae. The asymmetrical medial margin of the first gonapophysis usually includes some modification of the anterior wall, as mentioned by Davis (1955) for *Lopidea staphyleae* Knight, 1917, and is also the condition present in the outgroup taxa *L. robiniae*, *S. atritibialis*, and *Araucanocoris* sp. 2. Other Orthotylini may exhibit similar modified structures, for example, *Rolstonocoris* and *Melymacra* (Schaffner and Ferreira, 1995; Schwartz, 2004). Such modifications on the anterior wall occur elsewhere, as in some Phylinae (e.g., Davis, 1955; Schuh, 2006; Weirauch, 2006), but homology statements among these structures are not clear (Pluot-Sigwalt and Matocq, 2006; Schuh, 2006).

No other Orthotylinae so far examined have the dorsal lobe of the interramal sclerite elongate, narrowing distally, and barely curved medially as described for *Hadronema*, *Hadronemidea*, *Origonema*, and *Scutomiris* (figs. 30, 31, 40, 44, 46). The dorsal lobe in species of *Daleapidea* is less elongate, being more ovoid, resembling those found in certain *Ceratocapsus* species (e.g., Slater, 1950: pl. 6, fig. 20). *Daleapidea albescens*, however, has a more elongate dorsal lobe most similar to other *Hadronema*-group species (fig. 22). *Aoplonemella* has a reduced dorsal lobe, being nearly hemispherical (fig. 18), which may be related to the reduction of the vesica. The dorsal lobe in species of *Aoplonema* has a subapical enlarged medial margin that continues as a nearly truncate area before the rounded apex (fig. 8). This is similar to that found in *O. marginalis* and *Araucanocoris* sp. 2. Some species of *Orthotylus* have a similar structure

TABLE 4
Extended.

30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
0	1	0	1	0	-	1	1	0	1	-	0	0	0	0	1	1	0	1	0	0	3	1	0	0	1	1	0	0	-	0	0	1	1	1	1	1	2	1
1	0	0	1	0	-	1	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	1	1	2	0	3	0	-	1	1	1	1	1	1	0	1	0
1	0	0	1	0	-	1	1	0	1	-	0	1	0	1	1	1	1	0	-	0	4	1	0	0	0	1	2	0	-	1	0	1	1	1	1	1	0	1
1	0	1	1	1	1	1	1	0	0	1	0	0	0	0	1	1	0	1	0	0	2	0	0	0	1	1	0	0	-	0	1	1	1	1	1	0	0	1
1	0	0	1	0	-	1	1	0	1	-	0	0	0	0	0	1	1	0	-	0	3	1	0	1	2	1	0	0	-	0	0	0	1	1	1	0	0	0
1	1	1	0	1	0	0	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	0	1	0	4	0	2	1	0	0	1	0	1	0	1	0	1	2
1	1	1	0	1	0	0	0	0	0	0	2	-	1	0	1	1	1	1	1	1	0	1	0	4	0	2	1	0	0	1	0	1	0	1	0	1	0	1	2
1	1	1	1	1	0	1	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	1	1	0	1	0	1	0	1	0	1	1
1	1	1	1	1	1	1	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	1	1	0	1	0	1	0	1	0	1	1
1	1	1	1	1	0	1	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	1	1	0	1	0	1	0	1	0	1	1
1	1	1	1	1	0	1	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	1	1	0	1	0	0	-	0	0	1	1
1	1	1	1	1	0	1	0	0	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	1	1	0	1	0	1	0	1	0	1	1
1	1	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	2	1	2	0	-	1	1	0	1	1	1	0	1	0
1	1	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	0	1	0	4	0	2	0	-	0	1	0	1	1	1	0	1	2
1	1	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	0	-	0	1	0	1	1	1	0	1	1
1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	2	1	3	0	-	0	1	0	1	0	1	0	1	0
1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	2	1	3	0	-	0	1	0	1	1	1	0	1	0
1	1	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	2	1	3	0	-	0	1	0	1	1	1	0	1	0
1	1	1	1	1	0	1	1	1	0	0	1	-	1	1	0	0	1	1	1	1	1	1	1	0	3	0	1	0	-	0	1	0	0	-	1	0	1	1
1	1	1	1	1	0	1	1	1	0	1	2	-	1	0	1	1	1	1	1	1	1	1	1	0	4	0	2	0	-	0	1	0	1	1	1	0	1	0
1	0	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	0	0	2	0	-	1	1	0	1	1	1	0	0	1
1	0	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	0	0	2	0	0	1	1	0	1	1	1	0	0	1
1	0	1	1	1	0	1	1	1	0	0	2	-	1	0	1	1	1	1	1	1	1	1	1	0	0	0	2	0	-	1	1	0	1	1	1	0	0	1

of the dorsal lobe, although other members of the genus have different configurations of the dorsal lobe (Slater, 1950; Southwood, 1953). *Lopidea robiniae* and *Araucanocoris* sp. 1 have a lobate subapical and deeply cleft medial margin. This shape is common to other species of *Lopidea* (e.g., Slater, 1950). *Slaterocoris* has nearly parallelogram-shaped dorsal lobes, in which the apex is strongly curved medially (Slater, 1950: pl. 6, fig. 18). None of these configurations of the dorsal lobe resembles the one found in the *Hadronema* group, excluding *Aoplonema*.

Schuh (1989) suggested that Neotropical taxa should be examined to assess sister group relationships for *Daleapidea*, which is also true for the *Hadronema* group. Examination of "*Araucanocoris*" species showed that at least some of them possess a supragenital bridge, a character unusual among the Orthotylini. *Incacoris* Carvalho, 1961 is a Neotropical genus that resembles "*Araucanocoris*" due to its long hemelytra and short head. Male genitalia of *Incacoris* sp. from Bolivia (personal obs.) show no relationship whatsoever with the examined specimens of "*Araucanocoris*" or species of the *Hadronema* group either, in particular due to the absence of a supragenital bridge and different structure of the parameres (Carvalho, 1961). *Hadronemisca* and *Hadronemella*, two additional Neotropical genera, resemble species of the *Hadronema* group by the short and wide head and prominent eyes, but the male genitalic structure is different (e.g., Carvalho, 1977, 1984, 1985; Carvalho and Carpintero, 1992; Carvalho and Costa, 1993). Further examination of additional Neotropical taxa is needed to assess potential sister group relationships within the *Hadronema* group.

Aoplonema: Most members of the *Hadronema* group have two well-sclerotized spicules on the vesica, in which the right one is usually shorter than the left, and the latter has a pair of preapical rami. Only *Aoplonema* and *Aoplonemella* have a single sclerotized spicule. In *Aoplonema* it is deeply

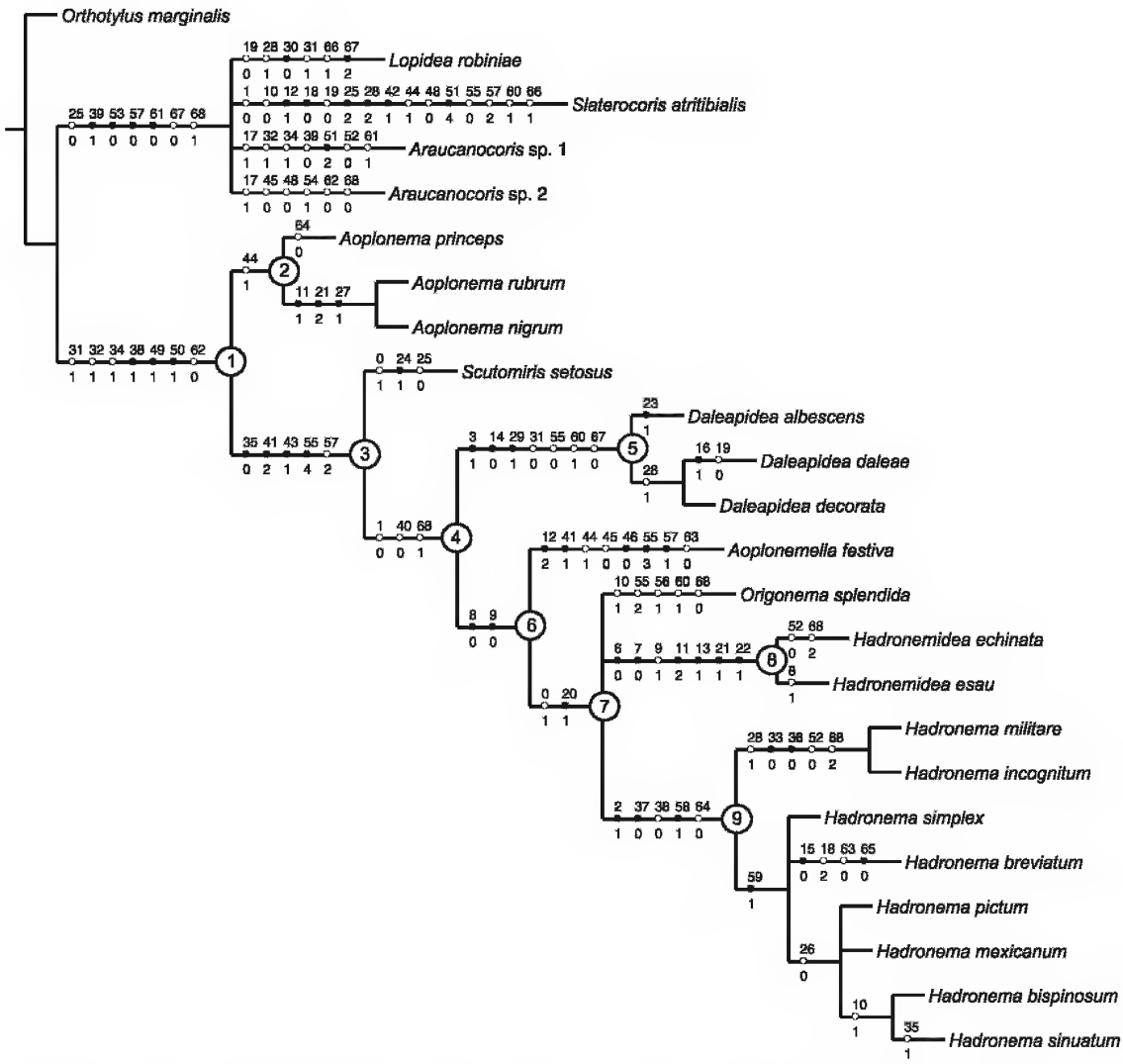

Fig. 49. Strict consensus cladogram of six most parsimonious trees found for the *Hadronema* group (L=150, CI=60, RI=76). Filled circles represent nonhomoplastic characters; open circles, homoplastic characters. Numbers above circles indicate character number (as in table 3), and numbers below indicate the character state. Numbers points to major clades (see text for details).

cleft, forming two lateral portions (figs. 7, 10, 13). Having a single spicule may be interpreted as the fusion of the two spicules found in other species of the *Hadronema* group. Evidence may be found in the shorter right portion, which may be homologous with the right spicule, and the left portion bearing a pair of rami projecting cephalad, similar to the condition in other taxa of the group. Of the outgroups studied, only *Slaterocoris* has a single spicule, but its configuration is different from what is found in the *Hadronema* group (Kelton, 1959: figs. 67, 68). *Aoplonemella* has an extremely reduced spicule, not bearing any ornamentation, spines, or projections, although other characters of the male genitalia (e.g., the presence of a supragenital bridge) and the structure of the left and right parameres place this taxon in the *Hadronema* group.

The phallotheca in *Aoplonema* is unique among the *Hadronema* group taxa in having its ventral surface well sclerotized. Other genera of the group have the proximal,

ventral portion of the phallotheca weakly sclerotized, and usually the opening reclined and broadly oval (figs. 17, 21, 28, 29, 39, 43).

Other characters that support the monophyly of *Aoplonema* are the structure of the dorsal lobe of the interramal sclerite in the female and the vestiture on the dorsum. As discussed above, the structure of the dorsal lobe is most similar to the configuration found in other Orthotylini rather than in other members of the *Hadronema* group. The vestiture, composed of simple decumbent setae and sericeous setae, is found also in *Scutomiris*, but not in other members of the *Hadronema* group, although it occurs widely in other Orthotylini and Miridae groups.

Scutomiris: This taxon shares some but not all of the characters of other members of the *Hadronema* group. In order to render monophyletic genera, this species is better placed in its own generic grouping. *Scutomiris* shares with *Aoplonema* a similar vestiture on the dorsum (fig. 45D), a lateral left basal protuberance on the phallotheca (fig. 43), and head structure without a conspicuous transverse carina. Nevertheless, *Scutomiris* has two separate spicules in the vesica, as well as a weakly sclerotized proximoventral surface, characters that are shared among other taxa of the *Hadronema* group. *Scutomiris* has an enlarged scutellum, which is an autapomorphy for this taxon within the *Hadronema* group.

Daleapidea: This group is supported by several synapomorphies. The structure of the genital capsule is unique among taxa of the *Hadronema* group in being longer than wide and in having the anterior margin of its aperture well defined and heavily sclerotized. In other members of the group the genital capsule is usually triangular or subquadrangular. Other Orthotylinae may have a well-defined aperture margin as well, but it does not occur within the *Hadronema* group. The enlarged male subbasal first antennal segment is unique among the group of genera. A similar condition of an enlarged first antennal segment is found in other Orthotylinae (e.g., *Ballella* Knight, 1959, *Eurotas* Distant, 1884, *Guaicurua* Carvalho, 1987, *Bahianisca* Carvalho and Wallerstein, 1978, and *Antennomiris* Carvalho and Schaffner, 1977). Nevertheless, in all of these taxa, the first antennal segment is either uniformly or apically enlarged, but not subbasally enlarged.

Daleapidea daleae and *D. decorata* are supported as sister species by the subquadrangular apex of the genital capsule. Furthermore, the absence of the metathoracic peritreme and evaporatorive area may support this grouping, although this is a homoplastic character present in other members of the *Hadronema* group.

Aoplonemella: Although *A. festiva* was placed in *Aoplonema* (Kerzhner and Schuh, 1995), it does not share with this genus the type of vestiture or male genitalic structure. As with *Scutomiris*, it is better placed in its own generic grouping. *Aoplonemella* exhibits several autapomorphies mostly involving the reduced male and female genitalia.

Origonema + *Hadronemidea* + *Hadronema*: Although the consensus tree shows a polytomy among *Origonema*, *Hadronemidea*, and *Hadronema* (fig. 49), the conflict results only from two characters. One is the relative size of the peritreme in the metepisternum (char. 26, table 3), which is large and with the evaporatory area reduced in *Hadronema* and *Origonema*, and absent and without any evaporatory area in *Hadronemidea*. Nevertheless, some *Hadronema* species do not have an enlarged peritreme, and have the evaporatory area wide and covering its dorsal margin (e.g., *H. pictum*, *H. bispinosum*). Because this condition is variously modified in other genera of the *Hadronema* group (e.g., *Aoplonemella* and *Daleapidea*), the polytomy is not considered to accurately reflect the relationships among these three taxa. The other conflicting character is the foreleg first tarsomere in the male (char. 5, table 3). In *Origonema* it is nearly cylindrical with normal setae on the ventral surface. In *Hadronema* and *Hadronemidea* the first tarsomere is flattened, expanded laterally, slightly concave, and covered ventrally with tenent setae. This type of modification of the fore tarsus is not present in any of the other members of the *Hadronema* group or in any other Miridae known. Because peritreme size shows some homoplasy, and the fore tarsus shows none, the latter may be considered to have a better fit (Goloboff, 1993) than does the former.

Therefore, I hypothesize that *Hadronema* and *Hadronemidea* are more closely related to each other than to *Origonema*, and this should be tested with additional characters.

Origonema: *O. splendida* was described as a species of *Hadronema* (Gibson, 1918). Nevertheless, *Origonema* does not share with *Hadronema* the modified foreleg in the male or the particular structure of the anterior wall of the female (see below). It likewise does not share the particular structure of the head of *Hadronemidea* (figs. 37A, 38A), or the curved mesotibia of the male (figs. 37F, 38B), although *O. splendida* has a subbasal enlargement in the mesotibia of the male (fig. 42F). As discussed above, *Hadronema* may be the sister group of *Hadronemidea*, despite the polytomy presented in the consensus tree (fig. 49). Because both *Hadronema* and *Hadronemidea* have various synapomorphies supporting each clade, it is better to consider *Origonema* as the sister group of these two taxa. Furthermore, *Origonema* is supported with a combination of some homoplastic characters (fig. 49). Doing otherwise would result in a morphologically variable group, supported with rather weak characters, in which other conspicuous morphological attributes may be obscured.

Hadronema: The synapomorphies supporting *Hadronema* also redefine the concept for this genus. Among these synapomorphies are the first tarsal segment enlarged in the foreleg of the male with the ventral surface covered with tenent setae (fig. 25, A, C, E, F) (shared with *Hadronemidea*), the ventral bifid protuberance at the base of the femur of the foreleg in the male (fig. 25D), and the central sclerotization of the anterior wall in the female (figs. 33, 34).

Hadronemidea: *H. echinata* was described in *Hadronema* (Gruetzmacher and Schaffner, 1977) and later placed in *Aoplonema* due to the absence of modified structures on the foreleg (Kerzhner and Schuh, 1995). As discussed above, only *Hadronema* males have forelegs with modifications in the first tarsal segment and at the base of the femur. *Hadronemidea echinata* does not share with *Aoplonema* the type of vestiture, which is composed of simple bristlelike setae only in *H. echinata*, and of simple decumbent setae intermixed with sericeous setae in *Aoplonema*. Furthermore, *H. echinata* has two sclerotized spicules in the vesica, whereas *Aoplonema* has only one spicule. *Hadronemidea echinata* shares more characters with *Hadronemidea esau*, a previously poorly known species. Together they form a monophyletic group, which is supported among other characters by the structure of the head with small eyes (figs. 37A, 38A) and by the mesotibia in the male curved inward (figs. 37F, 38B).

HOST-PLANT ASSOCIATIONS

Two approaches can be used to test evolutionary scenarios: mapping and optimization (Schuh, 2000b). Host-plant data were mapped on the strict consensus cladogram (fig. 50) and the nodes were optimized following the methodology of Carpenter (1989). Given an optimality criterion, optimization produces the most parsimonious character state assignment for every node on a given cladogram (Farris, 1970; Fitch, 1971; Schuh, 2000b; Wheeler et al., 2006). Host-plant optimization on a cladogram has been used by a number of authors to reconstruct ancestral plant-insect associations and to interpret the evolution of these relationships (e.g., Janz and Nylin, 1998; Braby and Trueman, 2006; Schuh, 2006; Silva-Brandão and Solferini, 2007; Soulier-Perkins et al., 2007).

Host-plant information was coded as an additional character in the matrix but was not used for the analysis. Because some of the taxa included in the analysis have multiple generic host associations within the same plant family, these were coded in the matrix as families rather than as genera. Some terminals have host-plant associations with more than one plant family. In these cases the terminals were treated as polymorphic. They were coded as such if the plant data were repeated in more than one collection event. Because insects can shift between host plants (e.g., Schuh, 2001; Lewinsohn et al., 2005) without necessarily having a defined sequence (e.g., Stonedahl and Schuh, 1986; Stonedahl and Schwartz, 1986; Stonedahl, 1990), the host-plant character data were treated as nonadditive. The resulting optimization pattern was analyzed with the unam-

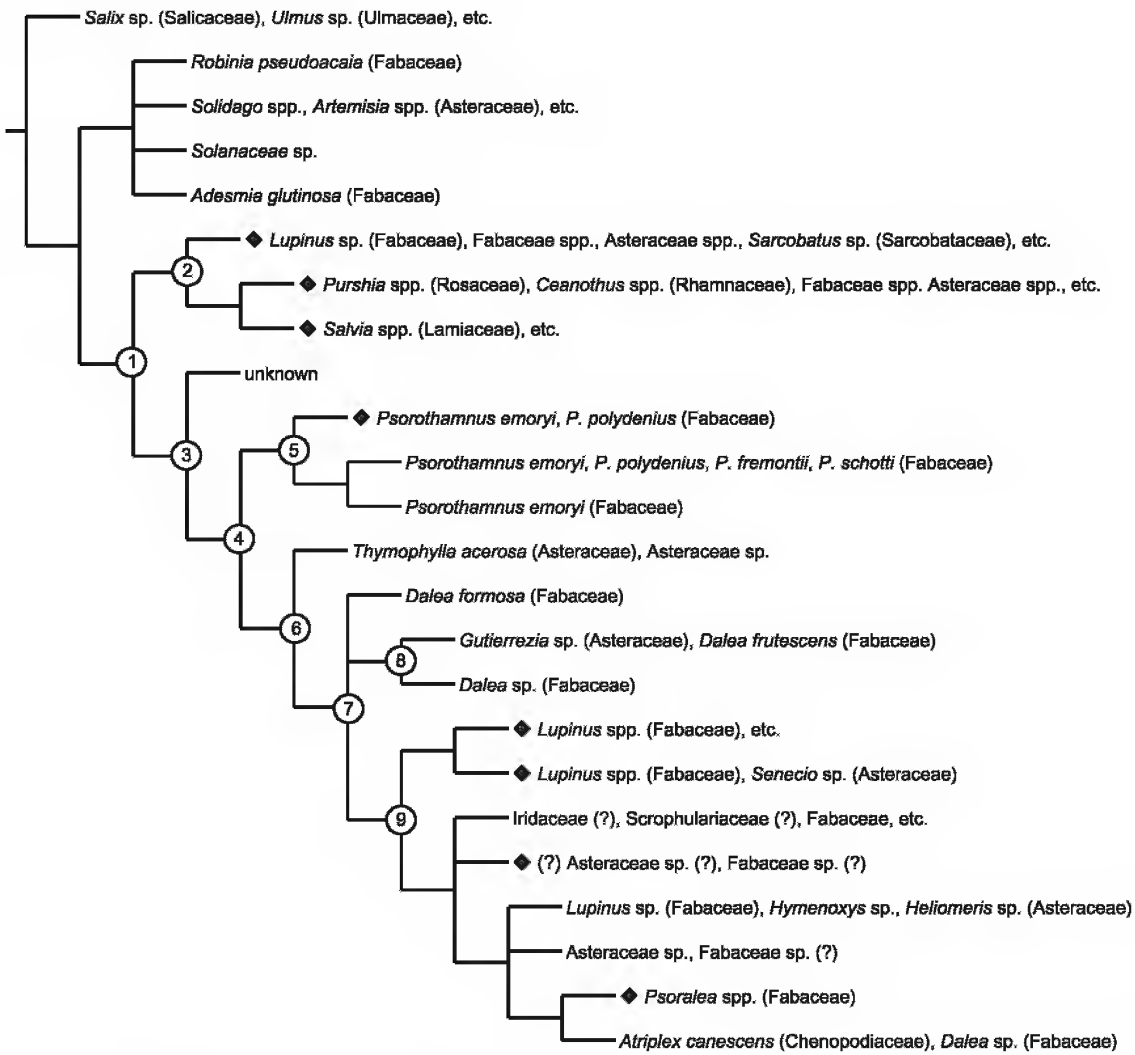
Salix sp. (Salicaceae), *Ulmus* sp. (Ulmaceae), etc.
Robinia pseudoacaia (Fabaceae)
Solidago spp., *Artemisia* spp. (Asteraceae), etc.
Solanaceae sp.
Adesmia glutinosa (Fabaceae)
◆ *Lupinus* sp. (Fabaceae), Fabaceae spp., Asteraceae spp., *Sarcobatus* sp. (Sarcobataceae), etc.
◆ *Purshia* spp. (Rosaceae), *Ceanothus* spp. (Rhamnaceae), Fabaceae spp. Asteraceae spp., etc.
◆ *Salvia* spp. (Lamiaceae), etc.
unknown
◆ *Psorothamnus emoryi, P. polydenius* (Fabaceae)
Psorothamnus emoryi, P. polydenius, P. fremontii, P. schotti (Fabaceae)
Psorothamnus emoryi (Fabaceae)
Thymophylla acerosa (Asteraceae), Asteraceae sp.
Dalea formosa (Fabaceae)
Gutierrezia sp. (Asteraceae), *Dalea frutescens* (Fabaceae)
Dalea sp. (Fabaceae)
◆ *Lupinus* spp. (Fabaceae), etc.
◆ *Lupinus* spp. (Fabaceae), *Senecio* sp. (Asteraceae)
Iridaceae (?), Scrophulariaceae (?), Fabaceae, etc.
◆ (?) Asteraceae sp. (?), Fabaceae sp. (?)
Lupinus sp. (Fabaceae), *Hymenoxys* sp., *Helomeris* sp. (Asteraceae)
Asteraceae sp., Fabaceae sp. (?)
◆ *Psoralea* spp. (Fabaceae)
Atriplex canescens (Chenopodiaceae), *Dalea* sp. (Fabaceae)
1
2
3
4
5
6
7
8
9

Fig. 50. Host-plant data mapped on the strict consensus species cladogram. Black diamonds indicate occurrences of Meloidae or cantharidin trap associations. Question marks indicate dubious records (see text for details).

biguous character state assignment for each node as implemented in WinClada. Fabaceae subgroups were further coded as an extra character and treated and optimized as explained above.

Reconstruction of the basal-node state for the *Hadronema* group results in Fabaceae as an ancestral association. Most of the ingroup taxa are associated with at least one species of Fabaceae. Two of the outgroup taxa, *L. robiniae* and *Araucanocoris* sp. 2, are also associated with Fabaceae. Furthermore, all Fabaceae associations of the *Hadronema* group, and those of the outgroup taxa as well, are with Papilionoideae species. Nevertheless, the basal node of the group is ambiguous in respect to the kind of papilionoid involved because *Aoplonema* is mostly associated with *Lupinus*, a Genisteae, whereas the remaining members of the *Hadronema* group are mostly associated with Amorphae legumes.

Aoplonema (node 2) includes species of Fabaceae as associated plants, as well as several other unrelated plant species, such as Rosaceae and Rhamnaceae in *A. rubrum*,

Lamiaceae in *A. nigrum*, and Asteraceae and Sarcobataceae in *A. princeps*. Nonetheless, if *Lupinus* is one of the host plants of *Aoplonema*, as in *A. princeps*, then the ancestral node is reconstructed as papilionoid. All of the other plant associations are interpreted as independent host changes in *Aoplonema*, in particular *A. nigrum*, which is mostly associated with species of *Salvia* (Lamiaceae).

Scutomiris (at node 3) has no known host-plant associations, but from the optimization scheme I hypothesize that the host plant for this taxon should be a papilionoid legume.

Node 4 is reconstructed as a daleoid (Papilionoideae: Amorphae) legume group that includes, among others, *Dalea* and *Psorothamnus* (Barneby, 1977; McMahon, 2005).

Daleapidea (node 5) is exclusively associated with species of *Psorothamnus*, another daleoid, although the usage pattern is not completely understood because more than one species of *Daleapidea* may feed on the same *Psorothamnus* species. Node 6 is reconstructed also as daleoid. The Asteraceae host association in *Aoplonemella* is regarded as an independent event in this taxon.

Node 7 is optimized as *Dalea*, due to associations with this plant genus in *Origonema*, *Hadronemidea*, and *Hadronema*. *Origonema* has been associated with *Dalea*, although based on just a few specimens. In *Hadronemidea* (node 8) the ancestral condition is reconstructed as *Dalea*, even though *H. echinata* has been associated with *Gutierrezia* (Asteraceae) based on a single collection event. More accurate host-plant associations for both *H. echinata* and *H. esau* are needed to draw general conclusions for this group. The ancestral node reconstruction for *Hadronema* is ambiguous (node 9). The clade containing *H. militare* and *H. incognitum* is ancestrally reconstructed as *Lupinus* with an uncertain reconstruction regarding Asteraceae associations. *Hadronema incognitum* has both Fabaceae and Asteraceae hosts, but in *H. militare*, Asteraceae host utilization is poorly documented. In *H. simplex* host-plant data are probably mistaken, with the real host plants not yet having been found. Host-plant data for *H. breviatum* are vague, but they at least point to Asteraceae and Fabaceae hosts. A similar situation is found in *H. mexicanum*. *H. pictum* has *Lupinus* and Asteraceae hosts documented. Both *H. bispinosum* and *H. sinuatum* have been associated with species of *Dalea*, although the latter has been associated mostly with *Atriplex canescens* (Chenopodiaceae). Future fieldwork is needed to gather more accurate host-plant data for many of the species of *Hadronema*. Only with these data will it then be possible to reconstruct the ancestral host plant pattern for *Hadronema* and discern which plant group represents the ancestral condition. The same applies to the *Hadronema* group in which more accurate plant information is needed to better understand the evolution of host plant utilization.

MELOIDAE ASSOCIATIONS

On the consensus tree, associations with meloid beetles or cantharidin traps are mapped (fig. 50, filled diamonds). All species of *Aoplonema* are known to be associated with meloids or cantharidin traps. *Aoplonema nigrum* has been associated with meloids (Pinto, 1978), and *A. princeps* and *A. rubrum* with cantharidin traps (Young, 1984b; personal obs.). *Daleapidea albescens* is associated with *Phodaga alticeps* (personal obs.), and it is the only species of the genus reported with any meloid association. Some species of *Hadronema* have been associated with meloids: *Hadronema incognitum* with unidentified meloids (personal obs.), and *H. militare* with species of *Lytta* (Young, 1984a). The only dubious association record is with *H. breviatum*. Young (1984b) recorded this species associated with cantharidin traps. I have not been able to confirm the species identification.

Feeding preferences of adult species of Meloidae are restricted to a single plant family, and less commonly to a single plant genus or species (e.g., Selander, 1960). Some of the Meloidae associated with the *Hadronema*-group taxa feed on the same plants as these mirids (e.g., *Epicauta* spp. on *Sarcobatus* and species of Fabaceae [Pinto, 1991]; *Lytta* spp. on species of *Lupinus* [Church and Gerber, 1977; Selander, 1960; Selander and Downey, 1963]), although a few may feed on different plant genera (e.g., *Phodaga* spp. and *Pleuropasta* spp. on *Tiquilia* [as *Coldenia*, Boraginaceae; Pinto, 1972, 1984]; *Lytta*

viridana on *Astragalus* spp. [as *Cnemidophacos* and *Diholcos*: Selander, 1960]). As discussed above (see "Materials and Methods") it is likely that repetitive plant data from different collection events represent a Miridae host plant. If Meloidae specimens were present on the plants at the same time as the Miridae specimens, they would be noticed by the specialized Miridae collector (e.g., *H. incognitum* AMNH_PBI 00100547), which is certainly not the case for many specimens examined in this study. Probably, a single plant species may serve as host for both Miridae and Meloidae. Only careful field observations will unambiguously identify plants as hosts of both Miridae and Meloidae. Young (1984b) reported that some *Hadronema*-group taxa were collected in cantharidin traps, not on plants with Meloidae, which strengthens the hypothesis that species of the *Hadronema* group probably are actively seeking these beetles. The nature and extent of meloid associations with *Hadronema*-group taxa are open for future research.

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AMNH	American Museum of Natural History, New York
ANSP	The Academy of Natural Sciences, Philadelphia, Jason Weintraub
CAS	California Academy of Sciences, San Francisco, Norman Penny
CNC	Canadian National Collection of Insects, Agriculture Canada, Ottawa, Michael D. Schwartz
CUIC	Cornell University Insect Collection, Ithaca, James K. Liebherr and E. Richard Hoebeke
FSCA	Florida State Collection of Arthropods, Florida Department of Agriculture, Gainesville, Julieta Brambilla
JTP	John T. Polhemus Collection, Englewood, Colorado
KU	Kansas University, Lawrence, Zachary H. Falin
MNRJ	Museu Nacional, Universidade Federal do Rio de Janeiro, Brazil, Luiz A.A. Costa
MZH	Museum of Zoology of Helsinki, Larry Huldén
TAMU	Texas A&M University, College Station, Joseph C. Schaffner and Edward C. Riley
UCB	University of California at Berkeley, Cheryl Barr
UCR	University of California at Riverside, Douglas Yanega

USNM United States National Museum of Natural History, Washington, DC., Thomas J. Henry
ZMAN Zoological Museum of Amsterdam, Johannes Duffels

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APPENDIX 1
HOST-PLANT DATA FOR *AOPLONEMA PRINCEPS*

Aoplonema princeps: White Cuneus Variant
Figure 1A, C

Asteraceae: 1 specimen
U.S.: Idaho, Idaho Co., Lolo Pass, at junction of Route 12 and FS Road 595 (to Granite Pass), Clearwater National Forest
Anaphalis margaritacea (Asteraceae): 3 specimens
U.S.: Oregon, Linn Co., H.J. Andrews Experimental Forest, Carpenter Mountain, end of Natl Forest Rd 1506-350
Artemisia tridentata (Asteraceae), big sage brush, sage brush: 2 specimens
U.S.: Colorado, Garfield Co., Grizzly Creek N. (Colo. 2193)
U.S.: Wyoming, Lincoln Co., Salt River Pass, 15 mi S of Afton on Rt 89
Chrysothamnus nauseosus (Asteraceae), gray rabbit brush, rabbit brush, rubber rabbitbrush: 1 specimen
U.S.: Oregon, Jackson Co., Siskiyou Summit, Old Road
Chrysothamnus sp. (Asteraceae), gray rabbit brush, rabbit brush: 12 specimens
Canada: British Columbia, Texas Creek, Lillooet
Conyza canadensis (Asteraceae): 1 specimen
U.S.: Utah, Sanpete Co., 13 mi E of Fairview on Rt 31, T14S R6E
Rudbeckia occidentalis (Asteraceae): 1 specimen
U.S.: Idaho, Franklin Co., Williams Canyon, mp 20 on Rt 36, T12S R42 S30
Salicornia sp. (Chenopodiaceae): 1 specimen
U.S.: Colorado, Montezuma Co., Cortez
Juniperus horizontalis (Cupressaceae): 3 specimens
Canada: Alberta, Waterton Park
Juniperus sp. (Cupressaceae), juniper, sabina: 12 specimens
Canada: Alberta, Manyberries
Lupinus leucophyllus (Fabaceae): 3 specimens
U.S.: Oregon, Union Co., 6 mi NW of Medical Springs, summit of Wallowa Mountains, Wallowa-Whitman National Forest, T5S R41E Sec27
Lupinus sp. (Fabaceae): 33 specimens
Canada: British Columbia, Oliver
Canada: British Columbia, Oliver, Sawmill Lake
Canada: British Columbia, Oliver, White Lake
U.S.: Oregon, Jackson Co., 0.5 mi S of Siskiyou Summit on Old Rt 99, Old Siskiyou Rd
U.S.: Oregon, Jackson Co., Siskiyou Summit, Old Road
U.S.: Oregon, Jackson Co., Siskiyou Summit, Old Siskiyou Hwy and Frontage Rd
U.S.: Oregon, Linn Co., HJ Andrews Experimental Forest, 1 mile from Road 350 end, Ridge Site
U.S.: Utah, Box Elder Co., 5 mi SW of Clear Creek Campground, Raft River Mountains
U.S.: Utah, Box Elder Co., Raft River Mountains, 5 mi SW of Clear Crk. Cmpgrd., T14N R13N
U.S.: Washington, Asotin Co., 2.5 mi S of Anatone, 2 mi N of Rattlesnake Summit
U.S.: Wyoming, Lincoln Co., Salt River Pass, 15 mi S of Afton on Rt 89
U.S.: Wyoming, Park Co., 19 mi E of Cooke City on Rt 212
U.S.: Wyoming, Teton Co., Grand Teton National Park, 2 mi SE of Colter Bay Village, St. 89
Chrysolepis chrysophylla (Fagaceae): 1 specimen
U.S.: Oregon, Lane Co., Blue River Reservoir
Monardella villosa (Lamiaceae): 1 specimen
U.S.: Oregon, Union Co., Elgin
Salvia sp. (Lamiaceae), sage: 14 specimens
Canada: British Columbia, Oliver, 7 mi E of Indian Reservation
Pinus contorta (Pinaceae), lodgepole pine: 4 specimens
Canada: Alberta, Waterton Park
Ceanothus sp. (Rhamnaceae): 9 specimens
Canada: British Columbia, Oliver
Canada: British Columbia, Summerland
Cercocarpus sp. (Rosaceae), mahogany, mountain mahogany: 1 specimen
U.S.: Utah, Summit Co., 4.5 mi E of Oakley, Weber Canyon Road
Holodiscus discolor (Rosaceae), oceanspray: 1 specimen
U.S.: Utah, Box Elder Co., 5 mi SW of Clear Creek Campground, Raft River Mountains
Sarcobatus sp. (Sarcobataceae), greasewood: 1 specimen
Canada: British Columbia, Oliver, Vaseaux Lake
Sarcobatus vermiculatus (Sarcobataceae): 18 specimens
U.S.: Utah, Uintah Co., 5–10 mi SW of Bonanza, T10S R24E Sec 17 (R2)
U.S.: Utah, Uintah Co., 5–10 mi SW of Bonanza, T10S R24E Sec 17 (R4)

Aoplonema princeps: Red Legs, Dark Brown Cuneus Variant
Figure 1D, E

Encelia virginensis (Asteraceae), Virgin River brittlebush: 4 specimens
U.S.: California, Riverside Co., Pauba Valley, T8S R1W S19
Viguiera laciniata (Asteraceae): 2 specimens
Mexico: Baja California, 38 km E of Rt 1 to Parque San Pedro Martir
Symphoricarpos albus (Caprifoliaceae), common snowberry: 1 specimen
U.S.: California, San Diego Co., Pine Hills
Astragalus purshii (Fabaceae): 1 specimen
U.S.: California, Riverside Co., Riverside
Lotus scoparius (Fabaceae): 5 specimens
Mexico: Baja California, 38 km E of Rt 1 to Parque San Pedro Martir
Lotus sp. (Fabaceae): 1 specimen
U.S.: California, Riverside Co., Temecula Canyon, Santa Margarita River
Eriodictyon californicum (Hydrophyllaceae): 1 specimen
U.S.: California, Tulare Co., California Hot Springs

Sphaeralcea emoryi (Malvaceae): 9 specimens
Mexico: Baja California, 38 km E of Rt 1 to Parque San Pedro Martir
Eriogonum fasciculatum (Polygonaceae): 1 specimen
U.S.: California, unknown locality
Frangula californica (Rhamnaceae): 1 specimen
U.S.: California, Tulare Co., 4.5 mi S of Three Rivers
Sarcobatus vermiculatus (Sarcobataceae): 1 specimen
U.S.: California, Siskiyou Co., east side of Lower Klamath Lake

Aoplonema princeps: Orange Legs, Dark Brown Cuneus Variant
Figure 1F

Artemisia sp. (Asteraceae), ragweed, sage brush, wormwood: 6 specimens
U.S.: Nevada, Esmeralda Co., 13 mi W of Lida on Rt 3
Artemisia tridentata (Asteraceae), big sage brush, sage brush: 1 specimen
U.S.: California, Mono Co., Mono Lake, N shore
Sarcobatus sp. (Sarcobataceae) greasewood: 2 specimens
U.S.: Idaho, Gem Co., Emmett
U.S.: Oregon, Malheur Co., Vale
Sarcobatus vermiculatus (Sarcobataceae): 183 specimens
U.S.: California, Siskiyou Co., 5 mi S of Merrill, Oregon, near Tule Lake
U.S.: California, Siskiyou Co., east side of Lower Klamath Lake
U.S.: Nevada, Esmeralda Co., 13 mi W of Lida on Rt 3
U.S.: Nevada, Lander Co., 11 mi S of route 50 on route 376, T17N R44E
U.S.: Nevada, Lyon Co., 8 mi N of Sweetwater summit on highway 22, Toiyabe National Forest
U.S.: Nevada, Nye Co., 28 mi N of Belmont on Rt 82
U.S.: Nevada, White Pine Co., 31.8 mi N of Highway 50 on Steptoe Creek Road

Aoplonema princeps: Colorado Variant
Figure 1B

Rhus trilobata (Anacardiaceae): 2 specimens
U.S.: Colorado, Douglas Co., Waterton
Astragalus sp. (Fabaceae): 12 specimens
U.S.: Colorado, Jefferson Co., Indian Hills
Astragalus sp. (Fabaceae): 1 specimen
U.S.: Colorado, Jefferson Co., Indian Hills
Ribes cereum (Grossulariaceae): 1 specimen
U.S.: Colorado, Douglas Co., Waterton
Penstemon sp. (Scrophulariaceae): 1 specimen
U.S.: Colorado, Jeffers1on Co., Lookout Mountain

APPENDIX 2
USI Numbers of Dorsal Habitus Specimens (for figs. 1–3)

Species	Male	Female
Aoplonema princeps A	104869	104878
A. princeps B	101299	101316
A. princeps C	—	107204
A. princeps D	77864, paratype	77864, paratype, female on same pin
A. princeps E	102223	102225
A. princeps F	102085	102090
A. nigrum	102665, holotype	102675, paratype
A. rubrum	102296, holotype	101245, paratype
Daleapidea albescens	100276	100491
D. daleae	100230	100225
D. decorata	100352	100408
Aoplonemella festiva	106162, small; 106177, large	106267, small; 106248, large
Hadronema bispinosa	65339	65395
H. breviatum	103893	103894
H. incognitum	100501, holotype	100525, paratype
H. mexicanum	104717, paratype	105601, paratype
H. militare	101033	101060
H. pictum	100801	100832
H. simplex	65400	106033
H. sinuatum	101174	101178
Hadronemidea echinata	105872	105890
H. esau	106836	106840
Origonema splendida	105909	105913
Scutomiris setosus	79827, holotype	79828, paratype

APPENDIX 3
USI Numbers for SEM Specimens (for figs. 4, 15, 20, 24, 25, 37, 38, 42, 45, and 47)

Species	USI no. (male)
Aoplonema princeps	102054
Aoplonemella festiva	106160
Daleapidea daleae	101210
Hadronema militare	102053, 105296 (detail of front tarsi)
Hadronemidea esau	103775
Hadronemidea echinata	106159
Origonema splendida	103944 (noncoated), 105921, 104784 (legs)
Scutomiris setosus	79855
Tupimiris scutellatus	105588